DOCUMENT RESUME

ED 254 054 EC 172 015

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TITLE Identifying Developmental Patterns of Normal and High Risk Visually Impaired Infants: Development of an Assessment Protocol.
INSTITUTION California Univ., Berkeley. Center for the Study of Visual Impairment.
SPONS AGENCY California State Dept. of Education, Sacramento. Div. of Special Education.
PUB DATE Jun 84
GRANT 01-03651-X850-00-83
NOTE 204p.
PUB TYPE Guides - Non-Classroom Use (055) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC09 Plus Postage.
DESCRIPTORS Affective Behavior; Cognitive Development; *Developmental Stages; *Evaluation Methods; Eye Hand Coordination; Infants; Interpersonal Competence; Language Acquisition; Motor Development; Play; *Visual Impairments

ABSTRACT

The report reviews assessment guidelines developed for visually impaired infants (birth-24 months). Project staff examined research on the assessment of infants with vision loss and identified material relevant to their needs. Following a review of existing assessment tools, guidelines were prepared in the following areas: social competence, communicative competence, play, and cognitive development. In addition, charts depict expected age and clarification notes for the development of functional vision, social/emotional skills, language development, cognitive development (including object performance, schemes for relating to objects, fine motor development, and gross motor development). A list of considerations is also included for the assessment of the home environment. Detailed recommendations for assessment and research are located in the appendix to the report. (CL)

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ED254054

IDENTIFYING DEVELOPMENTAL PATTERNS OF NORMAL AND HIGH RISK VISUALLY IMPAIRED INFANTS: DEVELOPMENT OF AN ASSESSMENT PROTOCOL

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This study was supported by a Special Study grant (01-03651-X850-00-83) from the Special Needs Division, California State Department of Education. Findings, conclusions, and other opinions expressed in this report are those of the authors and they do not reflect the official position of the California State Department of Education nor of the sponsoring agency, and no endorsement is implied.

EXECUTIVE SUMMARY

Since the immediate and long term effects of early visual impairment on children and their families can be devastating, it is critical that children with little or no vision be identified and assessed so that intervention can be implemented as early as possible. For this reason, it is necessary to have assessment tools that accurately assess development of the visually impaired. At this time, however, there are no protocols that adequately address the unique concerns of visually impaired and multihandicapped children. In practice, many clinicians choose items from existing tests developed for the normally sighted and adapt them for the visually impaired when possible. It is not sufficient, however, to know how children with vision loss compare with their sighted peers because the developmental rates and patterns of blind and sighted infants have been found to differ in the areas of cognition, socialization, language, and fine and gross motor skills. Furthermore, a comparative approach to assessment does not distinguish developmental differences that are "normal" for the visually impaired child from those that represent true developmental delays.

Recognizing the need for an appropriate assessment protocol for infants with visual impairment, project staff at the U.C. Berkeley Center for the Study of Visual Impairment have developed guidelines for the assessment of infants with vision loss. These guidelines were based upon 1) an extensive review of the literature examining the development of visually impaired infants, high risk infants, and intact children, 2) a review of existing assessment tools for visually impaired and intact infants, and 3) the clinical expertise of a review panel of specialists working with handicapped infants. Chapters summarizing the review of the literature and describing what is known and what needs to be investigated concerning infants with visual impairment have also been prepared.

The next step will be the development of the assessment protocol. The guidelines developed for this project will be further refined into items for an assessment scale. The scale will then be field tested with a large number of visually impaired infants.

Assessment of Social Competence

The establishment of a positive affective base from which effective social relationships can grow can be difficult for some visually impaired infants and their caregivers. Often, the interaction patterns and social signals of these infants differ and must be carefully explained to caregivers in order to achieve a positive bonding (Fraiberg, 1977). The patterns that exist must be examined for their appropriateness within the context of the caregiver-infant pair. What may be adaptive behavior for one pair may not be adaptive for another. Furthermore, adaptive behavior for a caregiver-infant pair at one point in time may not be adaptive at another point in time. In some instances, behaviors that were once appropriate become maladaptive when exchanges become too routinized without variations or expansions that promote social and cognitive growth. Without firm data regarding developmental expectations for visually impaired infants, especially those with additional handicaps, it is impossible to provide assessment guidelines elucidating developmental progressions, let alone age level expectations. It is possible, however, to generate a set of questions that should be considered on a case by case basis when examining the development of social competence for an infant with vision loss.

1. Has a positive affective base been established between caregiver and infant? Use of the Bromwich assessment protocol (1976) could be valuable here.

2. In what ways is the infant expressing needs, wants, and feelings? Examine vocal and motor channels. Look for alternatives to usual means of expression used by sighted children.

3. Are the infant's caregivers aware of the ways in which the child is expressing needs, wants, and feelings?

4. Are the caregivers providing opportunities for the infant to express needs, wants, and feelings? Do they provide ample time between turns for the child to respond?

5. What are the caregivers' social expectations for the infant at various

ages and are they realistic?

6. Are the caregivers' responses in synchrony with the infant's communicative attempts so that interactions are appropriately initiated and maintained? How does the infant communicate and why are communication attempts successful or unsuccessful?

7. Are the infant's responses in synchrony with the caregivers' communicative attempts so that interactions are appropriately initiated and maintained? How does the caregiver communicate and why are communication attempts successful or unsuccessful?

8. Has the infant achieved the concept of parent as a permanent object? This may lead to increased interaction with caregivers when not in proximity as well as the demonstration of attachment behaviors.

Based upon this information, a greater understanding of interaction patterns for a particular caregiver-infant pair can be achieved. The issue of appropriate intervention, however, is a sensitive one since the developmental patterns of social interactions and relationships for visually impaired infants at this time is not well understood. It is not clear that the patterns observed for normally sighted infants should be promoted. Until more research has been completed, the following factors should be considered for intervention programs:

1. When interactions are noted that are not synchronous, effort should be made to facilitate harmony between the caregiver-child pair. For example, caregivers may be persisting too long in activities (Rowland, 1980), infants may be using signs that are not readily deciphered by their caregivers (Fraiberg, 1977).

2. The appropriate amount and content of interaction between a caregiver and infant should be promoted, given the interaction styles of each at a certain point in time. Social interactions that are mutually satisfying can be promoted during common daily activities such as feeding, bathing, changing, etc.

3. Note when social interactions become over-routinized without variations

or expansions offered by either the caregiver or the infant. Develop strategies to promote minor variations which can extend cognitive and social growth while recognizing the importance of routines as a means of establishing a firm set of expectations and from which pleasure can be derived for both the infant and caregiver.

Assessment of Communicative Competence

Studies of blind children's language development provide new directions for assessment. The following guidelines are intended to generate more accurate assessments of blind children's communicative competence.

1. Language develops from early caregiver-child interaction. Before blind children communicate with words, we must examine how they attract and direct the attention of their caregivers and also how they monitor and respond to their caregivers' interest. Their early sign systems may need to be clarified for their caregivers.

2. Language reveals the ways in which children organize their experiences. By assessing use of early words, we may better understand blind children's linguistic and cognitive competence. Do they extend newly acquired words to a variety of referents? Do they understand the speech they imitate? Caregivers may need to provide additional stimulation to expand blind children's limited comprehension of language.

3. Language can be used for a number of communicative functions (e. g., label and describe objects, talk about oneself or others). Some of these functions (e.g., descriptions, references to other persons) may help children learn about their environment. An assessment should determine if blind children use a variety of language functions. If they do not, caregivers may need to model and reinforce particular language uses.

4. If communicative competence is to be assessed, we must consider how well blind children interact with other persons. Are they able to initiate topics as well as respond to the interests of other persons? When misunderstood, are they able and willing to try alternate approaches? Are interactions enjoyable for themselves and their partners?

5. The language from caregivers helps children learn to talk. How well do blind children elicit appropriate input from their caregivers? Do the families of blind children challenge them to advance in their language development?

The ultimate goal of an assessment is to determine intervention approaches best suited to blind children and their families. A review of recent literature indicates that visual impairment often affects caregiver-child interaction and the development of communicative competence. A language assessment must be sensitive to the special needs of the visually impaired.

Assessment of Cognitive Development

Until further research is available, the following guidelines may be useful for assessing infants with vision loss.

1. It is important to observe visually impaired infants' interest in their surroundings. Do they express their desires for objects and activities in ways that other persons can understand? Caregivers may need guidance to learn the attentional cues of these infants in order to provide appropriate input which will stimulate cognitive development.

2. Sighted infants' attention is attracted to objects and other persons in the environment. Do the interests of the visually impaired also expand from self-centered to environment-related concerns during the sensorimotor period? If not, intervention may be needed to assist these children to find interesting input outside themselves.

3. By 8 months, does the infant demonstrate some awareness of the permanence of objects and other persons? Without this concept, the visually impaired infant does not comprehend that objects exist when out of reach and must often rely on others to provide outside stimulation.

4. How does the infant explore objects? Does he or she use appropriate schemes to discover the properties of objects rather than indiscriminantly

mouth or bang objects? It is important that an infant with vision loss explore and compare the shapes and textures of objects with his or her hands in order to learn how to use objects appropriately.

5. Is the available input sufficiently complex and novel that the infant can acquire increasingly advanced conceptual skills? In some cases, the absence of visual information restricts the richness of social and environmental stimulation which may impede cognitive growth.

6. How does the infant learn the behaviors of other persons that cannot be seen? It is important that caregivers make their behavior meaningful to the visually impaired infant. Do they demonstrate ways to play with toys and ways to appropriately use household objects?

7. Does the infant sufficiently understand cause-effect relationships so that he or she anticipates the consequences of actions and effectively obtains desired events? When attempts are not immediately successful, is the infant able to find alternate means to desired goals? Do caregivers allow the infant to try again after he or she fails, or do they immediately solve problems for the infant? It is through the resolution of conflicts that infants expand their cognitive competence.

Assessment of Play

Play is an important method by which the infant learns to increase mastery and control of the environment. It fosters the development of cognitive, motor, language, and social skills. Experiential opportunities for exploration and social interaction can affect both the quality and quantity of play behaviors. It is widely recognized that early experiences for children with visual impairment differ from those of their normally sighted peers. It is not unexpected, therefore, that play behaviors have been found to differ in this population.

What is not known is the developmental sequence of play for infants with visual impairment and expected age levels for the attainment of various stages of play for this population. At this time, it is recognized that

standardized data are still needed before a quantitative measure of levels of play for normal infants can be developed (Krasnor & Pepler, 1980). As a result, it is more realistic to consider the qualitative aspects of play for assessment purposes and to examine the relationship of play behaviors to other developmental phenomena (e.g., motor skills, social skills). This is particularly true for the visually impaired since the developmental levels of play are not known and the patterns of development may differ substantially from that of normally sighted infants (Parsons, 1982; Sokolow, 1983).

Even though research evidence is still rudimentary, the assessment of play in visually impaired infants may be of value. First, play involves readily observable behaviors that may reflect cognitive ability. Secondly, play can provide a non-verbal qualitative measure of cognitive ability. Third, an analysis of play, including its cognitive and social components, can provide a rich picture of the way an infant interacts with the environment and can provide direction for intervention/stimulation programs. Finally, play has been found to be responsive to intervention, although the generalizability of intervention achievements is not yet clear.

How can clinicians apply the current level of knowledge of the cognitive components of play to the assessment of visually impaired infants?

1. A combined assessment of language and play can provide direction for a language intervention program.

2. Object play can be encouraged with visually impaired infants, and each infant's developmental pattern of play can be documented. Since the general developmental stages of play for visually impaired infants is not known, each child can only be encouraged to progress at his/her own pace at this time. Existing play assessment material can be utilized as a guide only, and age level expectations cannot be applied to visually impaired infants (e.g., McCune-Nicolich, 1980; Westby, 1980).

3. The emergence of symbolic play can be used as a non-verbal qualitative measure of cognitive ability marking the beginning of representational thought.

4. For infants with limited experience interacting with objects, as with some visually impaired children, the ability to learn appropriate object play after

brief training sessions is a qualitative indicator of previously untapped potential (Largo & Howard, 1979).

In terms of intervention, it is likely that object play can first be encouraged by providing objects that can be manipulated in one hand. The progression from two-object configurations held in the hand to two-object configurations on the floor noted by Gerhardt (1982) provides a beginning guide for understanding progressive development in toy play. Since play is responsive to intervention, it is possible that increased emphasis on appropriate play may decrease the time spent by visually impaired infants in stereotypical behaviors for stimulation, behaviors which do not serve to promote cognitive, social, or motoric growth.

It is hoped that the issues raised in these guidelines will be useful in planning assessments for visually impaired infants and in designing intervention programs which will meet the special needs of visually impaired infants.

REFERENCES

Bromwich, R. (1976). Focus on maternal behavior in infant intervention. American Journal of Orthopsychiatry, 46, 439-446.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Gerhardt, J. (1982). The development of object play and classifactory skills in a blind child. Journal of Visual Impairment and Blindness, 76, 219-223.

Krasnor, L. R. & Pepler, D. (1980). The study of children's play: Some suggested future directions. In H. Rubin (Ed.), Children's play (pp. 85-95). San Francisco: Jossey-Bass.

Largo, R. H. & Howard, J. A. (1979). Developmental progression in play behavior of children between nine and thirty months: II: Spontaneous play and language development. Developmental Medicine and Child Neurology, 21, 492-503.

McCune-Nicolich, L. (1980). A manual for analyzing free play. New Brunswick, NJ: Department of Education, Douglass College, Rutgers University.

Parsons, A. A. (1982). An exploratory study of the patterns of emerging play behavior in young children with low vision: The acquisition of concepts as evidence of cognitive development. Dissertation Abstracts International, 43, 759-A.

Rowland, C. M. (1980). Communicative strategies of visually impaired infants and their mothers. Unpublished doctoral dissertation, University of Oklahoma.

Sokolow, A. (1983). Differences in play and language development in a pair of blind and sighted twin infants. In M. E. Mulholland & M. V. Wurster (Eds.), Help me become everything I can be. Proceedings of the North American Conference on Visually Handicapped Infants and Preschool Children (pp. 117-122). New York: American Foundation for the Blind.

Westby, C. E. (1980). Assessment of cognitive and language abilities through play. Language, Speech, and Hearing Services in Schools, 11, 154-168.

INTRODUCTION

In recent years, researchers have begun to document and understand the developmental needs of visually impaired infants. It is now generally accepted that the normal course of development for an otherwise intact child, blind from birth, is different from the normal course of development for a sighted child (Warren, 1977). Differences occur in the development of gross and fine motor skills, language, socialization, and cognition (Fraiberg, 1977; Santin & Simmons, 1977; Stephens, 1972). Under optimal conditions, healthy children with little or no vision are able to adapt to their vision loss through the successful coordination of remaining systems, equaling many of the developmental achievements of their sighted peers, albeit using different routes. Unfortunately, for many blind and low vision infants, the adaptive solutions to vision loss are elusive. Without appropriate guidance and support, these children do not develop skills that signal cognitive, emotional, social, and motoric growth. Developmental delays are likely to be long-lasting and possibly permanent (Barraga, 1976).

It has been demonstrated that with proper guidance and support to parents and their visually impaired infants, many problems attendant with vision loss can be overcome (Fraiberg, 1971). To this end, professionals have provided information regarding differences and similarities in the developmental opportunities that promote optimal growth, and recommended intervention strategies designed to promote the development of visually impaired infants.

The identification of developmental delay in visually impaired infants has been a difficult task because professionals have had to distinguish developmental differences that are "normal" for a visually impaired child from those that are not normal. While some abnormal developmental differences may be quite obvious to professionals and parents, others can be more subtle and problematical. For example, it is fairly evident that a child who does not crawl, creep, or walk by one year requires intervention, but it is less obvious that a child whose hands do not engage in mutual fingering at the midline by six months also requires intervention. Should this latter difference continue and become a sustained delay, there will be a multitude of problems associated with this child's

fine motor skills. Ideally, intervention should be provided as soon as a problem can be identified and before the problem becomes so pronounced that the potential positive effects of intervention are reduced.

Another factor which must be considered in the development of visually impaired infants is the quality of the social and physical environment. Studies of other atypical groups (e.g., prematures; Rocissano, 1981; Sigman & Parmelee, 1979) have discovered relationships between the quality of parent-child interactions and children's language development. Without access to visual information which assists normally sighted children learn about their environment, input from others is of particular importance to visually impaired children. Yet visual impairment has also been identified as an impediment to the development of expected interaction patterns and can, in fact, decrease the child's access to input from others (Fraiberg, 1977; Kekelis & Andersen, 1984). In addition, Yarrow, Rubenstein, and Pedersen (1975) have found that both the variety and the complexity of play materials are related to exploratory behavior and preference for novelty in normally developing infants. The learning environment has also been postulated as critical to optimum development of visually impaired infants (Norris, Spaulding, & Brodie, 1957), although more evidence is needed to clarify specific relationships.

The need for assessment guidelines for visually impaired infants is a crucial one. At this time, there is no comprehensive program to address this need. Available assessment tools for the visually impaired do not incorporate current data on the development of blind children (e.g., Maxfield-Buchholz Scale, Maxfield & Buchholz, 1957), provide little guidance for the identification of visually impaired infants with developmental delay (e.g., GUIDE, Croft & Robinson, 1976), or include too few assessment items in the birth to 24-month age-range to make crucial decisions regarding potential developmental delays and intervention strategies necessary to promote growth in various skill areas (e.g., Reynell-Zinkin Scale, Reynell, 1979; Oregon Project, Brown, Simmons, & Methvin, 1979).

STUDY APPROACH AND FINDINGS

The goal of this project has been to develop assessment guidelines for visually impaired infants from birth to 24 months. This report summarizes work completed from September 15, 1983 to June 30, 1984.

Synthesis of Research

Developmental research for the normal infant population was reviewed and material relevant to the needs of the visually impaired was identified. In addition, developmental research for the visually impaired population was reviewed as well as relevant studies of other high-risk groups including the deaf and motorically-delayed. To accomplish this, a computer search of the literature was performed. Research has been collected in the following areas: mother-child interaction, child-child interaction, motor development, social-emotional development, language development, play development, cognitive development, development of visual functioning and home environment. This work was collected for normal infants, high-risk infants, and visually impaired infants.

To summarize our findings, we have found little new research specifically dealing with the development of visually impaired infants in the past 10 years. The major research emphasis has been restricted to the area of language development and caregiver-child interaction. There has been, however, a great deal of research conducted with the normal infant population. Since much of this new information is extremely relevant for the assessment of the visually impaired population, we have incorporated these research findings into our guidelines. In addition, the literature review of high-risk populations has identified a number of critical factors concerning caregiver-child interaction which are predictive of later development. These findings have been used to expand assessment guidelines regarding visually impaired infants. An additional component was added to the project based upon the literature review. It was decided to describe what is known about the development of visually impaired infants, discuss critical issues that require further investigation, and

examine developmental areas that have not been addressed in the literature but which warrant further investigation. In addition there was a need to describe the effects of the social and physical environment on the development of visually impaired infants and to stress the interrelationship of developmental areas under consideration. This information will provide direction for further research and also identify areas of concern for clinicians. Chapters were written that focused on social competence, communicative competence, cognition, and play. These chapters will be presented for possible publication to the American Foundation for the Blind. The chapters are included in the Appendix to this report.

Preparation of Assessment Guidelines

Available assessment tools for visually impaired infants were obtained (if not already available to the project staff) and reviewed. These included the Reynell-Zinkin Scale (Reynell & Zinkin, 1979), Oregon Project (Brown, Simmons, & Methvin, 1979), GUIDE (Croft & Robinson, 1976), Maxfield-Buchholz Scale (Maxfield & Buchholz, 1957), scales from O'Brien's work Alive..Aware... A Person (1976). General assessment tools for infants were obtained (manuals only, if not already available to the project staff) and reviewed. These included scales such as the Gesell Developmental Schedules (Knobloch & Pasamanick, 1974), the Bayley Scales of Infant Development (Bayley, 1969), the Cattell Infant Intelligence Scale (Cattell, 1947), the Learning Accomplishment Profile for Developmentally Young Children (Glover, Preminger, & Sanford, 1978), and the Home Observation for Measurement of the Environment (Caldwell & Bradley, 1984).

Our review of assessment tools has included those that evaluate overall infant development as well as those that examine caregiver-child relationships and child-environment relationships. Normal infant development scales share many of the same assessment items and few can be readily adapted for the visually impaired infant. Few of these scales have encompassed new research findings in child development from the past 10 years, and no scales for the visually impaired have incorporated such findings.

After the literature and assessment reviews were completed, project staff

prepared assessment guidelines in the following areas: social competence, communicative competence, play, functional vision, fine motor development, gross motor development, and home environment. Items were chosen that could discriminate skills and behaviors necessary for the optimal functioning of visually impaired infants from birth to 24 months. Many items were adapted from existing scales while others were based upon research data. When age ranges for achievement by the visually impaired were available for particular items, they were provided. Items were placed in developmental sequence for the visually impaired as well.

The Advisory Committee for the project was asked to apply clinical and research expertise in critiquing project results. Members of the Committee reviewed all project documents and met with project staff to discuss the chapters and guidelines. This feedback proved to be extremely valuable in finalizing the content of the assessment guidelines and in providing support for continued development of an assessment tool from the guidelines. A list of Advisory Committee members is included in the Appendix.

Based upon comments from Advisory Committee members, the assessment guidelines were revised. The play section was incorporated into the cognitive and social guidelines. Many items were deleted while others were clarified. Advisory Committee members suggested the appropriate developmental sequence for the items although empirical confirmation of this sequence is required. The section pertaining to assessment of the home environment was expanded. The final version of these guidelines can be found in the Appendix.

Development of High Risk Criteria

Due to the limited empirical information available regarding the development of visually impaired infants, and the wide range of responses from Advisory Committee members based upon the heterogeneous population with which they work, it was not possible to specify high risk criteria. It is therefore proposed that a follow-on project be conducted in which the assessment guidelines are further refined into preliminary assessment scales. These scales should be administered to a large number of totally blind infants and infants with residual vision so that more precise developmental milestones for these

two populations can be established.

Other Activities

Project staff presented the preliminary results of the project at the annual conference of the California Transcribers and Educators of the Visually Handicapped in March, 1984. Application to present project results has also been submitted to the California Council for Exceptional Children conference in November, 1984 and the Annual Council for Exceptional Children conference in April of 1985. We have contacted the American Foundation for the Blind regarding the publication of the literature review chapters, and they have requested the chapters for examination.

CONCLUSION AND RECOMMENDATIONS

Since the immediate and long term effects of early visual impairment on children and their families can be devastating, it is critical that children with little or no vision be identified and assessed so that intervention can be implemented as early as possible. This project is a beginning step in the development of appropriate assessment measures addressing the needs of very young visually impaired children. Although the final result--assessment scales for visually impaired infants--cannot be reached immediately due to the limited amount of research in this area, this project provides direction for the development of these scales and clearly identifies areas in which additional research is needed.

It is recommended that the assessment guidelines developed for this project be further refined into assessment scales with normative data for infants who are totally blind and infants with some remaining vision. Outcomes of the follow-on project will include the U. C. Berkeley Assessment Scales for Visually Impaired Children, preliminary standardization data for the new assessment instrument, and documentation of developmental milestones for a large number of visually impaired infants. Detailed recommendations for assessment and research can be found in the literature review located in the Appendix to this report.

REFERENCES

Barraga, N. C. (1976). Visual handicaps and learning. Belmont, CA: Wadsworth.

Bayley, N. (1969). Bayley scales of infant development. New York: The Psychological Corporation.

Brown, D., Simmons, V., & Methvin, J. (1979). Oregon project for visually impaired and blind preschool children. Medford, OR: Jackson County Education Service District.

Caldwell, B. M. & Bradley, R. H. (1984). Home observation for measurement of the environment. Little Rock, AR: University of Arkansas at Little Rock.

Cattell, P. (1947). The measurement of intelligence of infants and young children. New York: Psychological Corporation.

Croft, N. B. & Robinson, L. W. (1976). GUIDE developmental skills. Boise, ID: Educational Products and Training Foundation.

Fraiberg, S. (1971). Intervention in infancy: A program for blind infants. Journal of the American Academy of Child Psychiatry, 10, 381-405.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Glover, M. E., Preminger, J. L., & Sanford, A. R. (1978). Early learning accomplishment profile for developmentally young children. Winston-Salem, NC: Kaplan Press.

Kekelis, L. S. & Andersen, E. S. (1984). Family communication styles and language development. Journal of Visual Impairment and Blindness, 78, 54-65.

Knobloch, H. & Pasamanick, B. (Eds.) (1974). Gesell and Amatruda's developmental diagnosis. The evaluation and management of normal and abnormal neuropsychologic development in infancy and early childhood (3rd ed.) Hagerstown, MD: Harper & Row.

Maxfield, K. E. & Buchholz, S. (1957). A social maturity scale for blind preschool children: A guide to its use. New York: American Foundation for the Blind.

Norris, M., Spaulding, P. J., & Brodie, F. H. (1957). Blindness in children. Chicago: University of Chicago Press.

O'Brien, R. (1976). Alive..Aware...A person. Rockville, MD: Montgomery County Public Schools.

Reynell, J. (1979). Manual for the Reynell-Zinkin scales. Developmental scales for young visually handicapped children - Part 1. Windsor, Berks., England: NFER Publishing.

Rocissano, L. (1981). Synchrony and joint attention in mother-toddler interaction and language outcome. Paper presented at the New York Child Language Conference, New York.

Santin, S. & Simmons, J. N. (1977). Problems in the construction of reality in congenitally blind children. Journal of Visual Impairment and Blindness, 71, 425-429.

Sigman, M. & Parmelee, A. H. (1979). Longitudinal evaluation of the pre-term infant. In T. Field, A. Sostek, S. Goldberg, & H. Shuman (Eds.), Infants born at risk (pp. 193-217). New York: SP Medical and Scientific Books.

Stephens, B. (1972). Cognitive processes in the visually impaired. Education of the Visually Handicapped, 4, 106-111.

Yarrow, L. J., Rubenstein, J. L., & Pedersen, F. A. (1975). Infant and environment. Early cognitive and motivational development. New York: Wiley.

Warren, D. (1977). Blindness and early childhood development. New York: American Foundation for the Blind.

APPENDIX

Advisory Committee

Assessment Guidelines

Literature Review Chapters

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Susan Recchia, M.A.	Infant Specialist, Blind Children's Center, Los Angeles.

FUNCTIONAL VISION OBSERVATION

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
newborn	Fixates and refixates caregiver's face		
newborn	Regards caregiver's face in mirror		
0-1m	Pupils miotic and reactive to light	Present in full term healthy infant. Refer for full vision evaluation if paradoxical pupil state.	
0-1m	Preferential looking to gross targets		
0-1m	Rudimentary searching and scanning	Refer for full vision evaluation if nystagmus present, especially gross, non-fixating, wandering nystagmus.	
1m	Eyes follow caregiver or examiner as moves to side		

FUNCTIONAL VISION OBSERVATION

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
1m	Vestibular/ocular reflex	When spun 30°-45°, child will fixate on examiner's eyes.	
1m	Visually evoked response acuity 20/500-20/100; preferential looking acuity 20/800-20/200		
1m	Attention to environment	Observe child's visual exploratory behavior particularly when first brought into a room and free to follow own interests. Credit if child turns head freely in visual exploration either while being carried or at other times when not being offered specific stimuli.	
1-3m	Blinks at shadow of hand	Lids close if hand is rapidly moved across field of vision at 2" (5 cm) from head to chest and back several times.	

FUNCTIONAL VISION OBSERVATION

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
2m	Visually evoked response acuity 20/400-20/80; preferential looking acuity 20/800-20/200; optokinetic nystagmus acuity 20/400		
1-8m	Searches with eyes for sound	With child lying in crib, prop head up in midline position, being careful not to block ears. Stand at head of crib out of direct line of vision and ring the bell, first to one side and then the other, out of his visual field and about 2 feet from his ear. Repeat using a rattle. At this level there is not yet definite head-turning to the sound but the child's eyes will move rather slowly from side to side in search of the sound.	
1-5m	Reacts to disappearance of face	While child is looking at your face, quickly move out of his range of vision, but watch his facial expression from above his head or wherever feasible. Note whether his smile vanishes, his eyes try to follow, or his activity level changes.	

FUNCTIONAL VISION OBSERVATION

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
1-6m	Reaches for parent's face	Visually Guided Behavior. Child moves arm in direction of parent's face even though movements are very slightly coordinated.	
3m	Visually evoked response acuity 20/300-20/60; preferential looking acuity 20/600-20/150; optokinetic nystagmus acuity 20/400		
3-6m	Glances from one object to another	While child is lying in crib and propped to midline position, hold bell in one hand and rattle in other, about 8 inches apart above his head with both objects in visual field. Gently shake one and then the other to make a soft sound. Continue alternating between bell and rattle several times, allowing several seconds between shakes for the child's eyes to move from one to the other. Credit if child's eyes move back and forth at least 3 times between the bell and rattle in response to the sound of each.	

FUNCTIONAL VISION OBSERVATION

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
3-6m	Inspects own hands	Observe child's behavior during periods of free activity; e.g., while lying in crib. Note whether child looks at hands. Credit if child looks attentively at his hand or hands.	
4m	Visually evoked response acuity 20/100-20/40; preferential looking acuity 20/600-20/200; optokinetic nystagmus acuity 20/200		
5m	Visually evoked response acuity 20/75-20/25; preferential looking acuity 20/200-20/30; optokinetic nystagmus acuity 20/200		

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
4-10m	Attends to scribbling	Visually Guided Behavior. Place piece of paper on table in front of child; then place crayon on paper with tip pointing away from child. If child makes no effort to touch crayon to paper, take crayon and scribble plainly with obvious writing gestures. Then give crayon to child with directions (by word and gesture) to Write. Credit if child attends to demonstrated scribbling.	
6m	Visually evoked response acuity 20/30-20/20; preferential looking acuity 20/150; optokinetic nystagmus acuity 20/100		
6-13m	Prewalking progression	Place child on stomach on firm flat surface with toy in front of child but out of reach. Note child's mode of locomotion. Credit if child makes forward progress of 9 inches or more on abdomen (crawling), on his hands and knees (creeping), on his hands and feet (quadruped), or in a sitting position (hitching on buttocks). (Sitting and standing upright not dependent on vision.)	Fraiberg 13.25 m

FUNCTIONAL VISION OBSERVATION

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
8m	Follows bright object past midline in 180° and all other planes	Move bright object in a circle about 12 inches in diameter above child's eyes making several complete excursions. If child's eyes leave object, move it into his gaze and resume circling when child has again focused on the object. Credit if child follows circular motion in both upper and lower halves of the circle, even though his eyes may not follow in one continuous complete circle.	
8-15m	Initiates movement of another person	Visually Guided Behavior. Credit if child makes any effort to imitate a movement such as stirring a spoon in a cup, pounding a drum, shaking a bell, clapping hands.	
7-16m	Looks at pictures in a book	Visually Guided Behavior. Child looks at large, clear pictures in bright colors with simple lines. Child must look at specific pictures rather than the book in general.	
18-24m	Touches 5 large clear pictures in a book when named	Visually Guided Behavior.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
18-24m	Matches 5 objects with 5 large clear pictures of same objects	Visually Guided Behavior.	

SOCIAL/EMOTIONAL

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
1m	Quiets when picked up	Child quiets when picked up.	
1-2m	Responds to voice *L **H	Child makes definite response to speaking voice when person out of range of vision. Response can be head turning, vocalization, cessation of activity, quieting, changing facial expression, or other indications of attention.	Norris et al. 6m > 75%
1-3m	Vocalizes once or twice (babbles or coos)	Child vocalizes in any way other than crying.	Norris et al. 6m > 75%
2-4m	Social smile: experimenter/ caregiver talks and smiles	Child smiles or laughs in response to gross tactile stimulation and animated speech. Tactile stimulation includes touching abdomen, stroking arms or legs, tickling any part of body.	
1-6m	Adjustment to lifting	When child is lying on back in crib and hands are placed under child's arms preparatory to lifting, child tenses body or shoulders or moves arm adjustively in anticipation. Child may also vocalize. Reaction may be delayed, especially in a totally blind child. Credit motor or vocal anticipatory behavior.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
4-7m	Aware of being held by stranger	When held by a stranger, child startles, looks wide-eyed at stranger, quiets, cries, stiffens or otherwise plainly shows awareness of stranger.	
4-6m	Pleasure shown	Child responds positively to toy through active engagement. Child explores toy with fingers, exhibits postural change or otherwise shows positive reaction.	
4-8m	Vocalizes attitudes *L	Note expressive vocalizations associated with: (a) Pleasure during activity with toys or other contented play, or in social participation; (b) Displeasure, but not crying, as when play is interrupted, toys removed, or child is restrained; (c) Eagerness, as in anticipation when a toy is brought near or a person approaches; (d) Satisfaction, as on attaining a toy or solving a problem. Credit any of these kinds of vocalizations.	
5-8m	Hands explore face of mother, father, or other familiar person	Child traces facial features in a discriminating manner and is aware of what is familiar and unfamiliar.	Fraiberg 5-8m

SOCIAL/EMOTIONAL

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
7-15m	Stranger anxiety	Child may "clutch" caregiver and reject stranger. (With unfamiliar person, child expresses vocal displeasure, avoidance and motor resistance to approach, followed by active seeking of caregiver.)	Fraiberg 7-15m
8-10m	Attracts personal attention	Child cries, kicks, whines, moves fingers, vocalizes when desires attention. Behavior may not be specifically goal-directed.	
8-12m	Cooperates in familiar interactive games	Child shows interest and understanding of interactive games such as peek-a-boo, bouncing, pat-a-cake, etc. Child anticipates an action in the game by initiating an action (e.g., moving hands in an attempted pat-a-cake or moving body up and down for bouncing) or shows familiarity by smiling, vocalizing, postural change, or touching partner's hand.	
9-12m	Indicates time out	Child indicates desire for decreased interaction by placing hands on face, resting head on arm, turning away, or some other way to decrease engagement.	

SOCIAL/EMOTIONAL

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
9-12m	Engages in social behavior with peers and siblings	One child's social behavior (smile, vocalization, approach, object related movement, look, touch) is responded to by another child's social behavior.	
11-18m	Proximity-seeking towards caregiver's request	When the caregiver is at tactile remove, the child reaches toward caregiver, creeps directionally toward caregiver, calls "mama", or otherwise seeks her.	Fraiberg 10.5-16m
12-18m	Repeats performance	Child repeats an act that is socially reinforced.	
12-18m	Gives toy to adult upon verbal request	Child actively releases toy in adult's hand.	Maxfield-Buchholz 0-12m 20% 12-24m 66% 24-36m 89%
11-21m	Stranger anxiety reappears (separation protest)	Child seems to have a fear of strangers and an increased anxiety at separation from caregiver.	Fraiberg 11-21m

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
16-20m	Initiates social interaction	Child indicates desire to be played with by following, tugging, vocalizing.	
18-22m	Enjoys being with other children	Child obviously enjoys play alongside other children. May be some attempt to defend own rights with considerable snatch and grab of other children's property.	Norris et al. 9m < 25% 12m < 25% 15m > 25% 24m > 50% 27m < 50% 30m < 50% 36m > 75% Maxfield-Buchholz 0-12m 0% 12-24m 36% 24-36m 59% 36-48m 77%
18-24m	Demonstrates possessiveness	Child claims desired objects as own.	
18-24m	Autosymbolic play	Child pretends to go to sleep, drink from a cup, eat from a spoon.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
19-24m	Symbolic play with other actors	To caregiver, another adult, or child the child feeds bottle, brushes another's hair, covers another with blanket.	
19-24m	Domestic mimicry	Child plays house and is the mommy, daddy, or baby. Toys are realistic--not models. Child pretends to mop floor, read a book.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
.1m	Responds to sound of bell **H	Gently ring bell about 12" from child's ear. In a few seconds, ring bell near other ear. Child responds with blink, crying, cessation of activity, increased activity, frown.	
1m (.3-2m)	Responds to voice. *S **H	Stand behind and to side of child and talk to child. Child turns head, vocalizes, stills, or changes facial expressions.	Norris et al. 6m > 75%
2m (.5-5m)	Vocalizes at least 4 times	Child vocalizes at least 4 times with throaty sounds: ah, uh, coos, gurgles, sighs, grunts.	
2m (1-5m)	Vocalizes 2 different sounds	Child produces at least 2 separate distinguishable syllables such as ma, a, uh.	
2m	Differentiated cry	Cries of hunger and pain, for example, are different.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
4m	Vocalizes consonant sounds	Babbles k, g, b.	
4m	Experimental vocal play **H	Child practices vowel sounds.	
4m	Child vocalizes when imitated **H	Child's sounds are imitated. Child continues to vocalize although not necessarily same sounds.	
5m (3-8m)	Vocalizes attitudes *S	Infant vocalizes pleasure during play; displeasure (other than crying) when restrained or interrupted; eagerness in anticipation.	
7m (5-12m)	Vocalizes 4 different syllables	Child produces at least 4 different, distinct syllables such as ma, da, aan.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
7m	Demands personal attention	Child uses vocal or non-verbal means to attract attention.	Norris et al 6m > 75% Maxfield-Buchholz 0-12m 76% 12-24m 89%
8m (5-12m)	Cooperates in games	Initiate a play routine such as peek-a-boo, "round and round the garden," "so big." Child actively participates in game.	
8m (5-14m)	Listens selectively to familiar words.	Familiar words such as mama or shoe are spoken. Child responds by vocalizing, imitating word, or changing facial expression.	Fraiberg 6.6-11.5m range 8.6m median
8m (5-14m)	Says da-da or equivalent.	Child vocalizes 2-syllable repetition of same sound.	Norris et al. 6m < 25% 9m > 25% 12m >75%
9m	Imitates sounds	Child imitates laughs, coughs, vocal sounds.	

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EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
9m (6-14m)	Responds to verbal request	Make verbal request that child has previously responded to, such as Wave bye-bye, or Where's daddy? Child appropriately responds.	Fraiberg 6.6-13.5m range 9.8 median
10m	Initiates interaction	Infant uses vocal and non-verbal means to initiate social exchanges.	
11m	Says one word	Child uses one word in meaningful way.	Norris et al. 9m ↖25% 12m >25% 15m >50% 21m >75%
12m	Jabbers expressively	Child babbles with inflections that are expressive.	Fraiberg 6.9-16m range 9.4m median Maxfield-Buchholz 0-12m 52% 12-24m 86%
12m	Uses question inflection	Uses rising inflection at end of vocalization that sounds like a question.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
12m (9-18m)	Imitates words *C	Child imitates word (even if consists of only vowels).	Fraiberg 8.9-17.5 range 10.3 median
12-13m	Gives mother toy upon request		
14m (10-23m)	Says 2 words	Child produces 2 words in meaningful way (approximations acceptable).	Fraiberg 12.7-32m range 18.5 median Norris et al. 12m <25% 15m >25% 18m >50% 24m >75% Maxfield-Buchholz 0-12m 0% 12-24m 38% 24-36m 82%
14-15m	Says hi	Child says hi in order to attract attention or to greet others.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
15m (11-23m)	Shows shoes, other clothing, or own toy	Child correctly identifies (by pointing or showing) item of apparel or toy.	
15-16m	Words, five	Child has vocabulary of 5 words which are used with consistent meaning.	Norris et al. 12m < 25% 18m > 25% 24m > 50% 27m > 75%
15-20m	50 word vocabulary		Bigelow 16-21m
17m (13-27m)	Names 1 object	Prompt child to name object by showing, offering, or requesting label. Child names ball, watch, pencil, scissors, or cup.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
18m (14-27m)	Uses words to make wants known	Child uses 1 or more words with command intonation or with gesture to express his wants.	Fraiberg 13.2-26.9m range 20.6 median Norris et al. 15m < 25% 18m > 25% 24m > 75% Maxfield-Buchholz 0-12m 2% 12-24m 23% 24-36m 70%
18-24m	Extends meaning	Uses 1 word for many different objects that share physical or functional properties.	
18-24m	Uses noun phrases and adjectives	Child combines nouns with adjectives describing nouns.	
20m	Relates immediate experiences	Child talks about event that has just taken place.	

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
21m (16-30m)	Sentences of 2 words	Child can put together 2 words denoting 2 concepts into 1 utterance.	Fraiberg 17.9-37.3 range 26.3 median Norris et al. 18m < 25% 24m > 25%
24m	Uses questions	Child asks 2 different kinds of questions (e.g., Where's ---?; Is that ---?; What's that?).	
24m	Follows same topic	Child responds to partner's speech most of the time.	

COGNITIVE DEVELOPMENT

- OBJECT PERMANENCE -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
7-9m	Recovers toy	Infant drops toy or toy is taken from child. Toy is then placed on infant's chest, infant recovers it.	Norris et al. 6m >50% 9m >75% Maxfield-Buchholz 0-12m 86% 12-24m 98%
7-11m	Midline reach and attainment on sound cue	Familiar toy/object is sounded at infant's midline. Infant reaches for and attains toy/object.	Fraiberg 0:6:18-0:11:1 range 0:8:27 median
18-24m	Midline reach and attainment of quiet toy	Quiet toy is pulled away at midline. Infant reaches for and attains toy.	
21-24m	Reaches for and attains sound-making toy at side	Sound toy is pulled away from infant at midline front and moved to side. Infant recovers toy.	

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COGNITIVE DEVELOPMENT

- MEANS FOR OBTAINING DESIRED ENVIRONMENTAL EVENTS -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
4-8m	Makes interesting event last	Infant repeats actions that accidentally produce interesting results (e.g., swings arms and legs to activate mobile; shakes rattle to make noise)	
9-12m	Purposefully produces sound or action	Infant purposefully hits lever, pulls string, or turns dial on toy to produce desired outcome.	

COGNITIVE DEVELOPMENT

- IMITATION -
VOCAL
GESTURAL

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
3m	Imitates sounds	Sounds that are within child's repertoire are produced. Infant vocalizes similar sounds.	
9m	Imitates sound combinations	Sound combinations (e.g., da, ma) that are within child's repertoire are produced. Infant imitates similar combinations of sound.	Norris et al. 6m < 25% 9m > 25% 12m > 75%
10-12m	Imitates action of another person	Action is performed that child can hear (e.g., desk bell is tapped). Child imitates action.	
12m (9-18m)	Imitates words *L		Fraiberg 8.9-17.5 range 10.3 median

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COGNITIVE DEVELOPMENT

- CAUSALITY -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
2m (1-4m)	Anticipatory excitement	In approach situations, when caregiver begins to lift, feed, or play with infant, infant reacts with rapid breathing, vocalizing, increased activity, or quieting.	
9-12m	Some understanding of causality outside themselves	Activity is demonstrated to child (e.g., banging of drum, activating of jack-in-box). After demonstration, infant touches person's hand to continue activity.	
15m	Request other person to perform actions	Activity is demonstrated to child (e.g., winding up toy, pulling string). When activity stops, infant hands toy to person.	
18-24m	Tries to activate toy after demonstration	Activity is demonstrated to child (e.g., pulling string of See-n-Say, turning jack-in-box crank). When activity stops, infant tries to activate toy.	

COGNITIVE DEVELOPMENT

- OBJECT RELATIONS IN SPACE -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
3-5m	Localization of source of sound **H	A noise-making toy is shaken to left/right side of infant. Infant turns in direction of sound.	
8-10m	Bangs 2 cubes at midline		
13-16m	One cube in cup	Child is asked to put cube into cup. If necessary, the task is demonstrated. Child places cube into cup.	Norris et al. 12m < 25% 15m > 25% 18m > 50% 24m > 50%
13-16m	Removes objects from containers		
18m	Directed locomotion	Child is called from across the room. Child moves deliberately towards voice.	

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COGNITIVE DEVELOPMENT

- OBJECT RELATIONS IN SPACE -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
18-24m	Uses receptacle for carrying	Child uses basket or other receptacle for carrying small objects from one place to another.	Norris et al. 12m < 25% 27m > 25%
18-24m	Child recalls location of object that hasn't been played with in several days and finds it		

COGNITIVE DEVELOPMENT

- SCHEMES FOR RELATING TO OBJECTS -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
3m	Simple play with rattle	Offer child rattle or put in his hands. Child shakes, chews, or engages in other playful activity with it.	Norris et al. 6m > 75%
3m (1-6m)	Fingers hand in play *FM	Child playfully fingers 1 hand with other.	
3m	Carries playthings in hand to mouth		
4-12m	Systematic use of objects in exercise of schemes	Uses hands and mouth to explore objects rather than indiscriminantly mouthing and banging.	
5-8m	Retains 2 toys *FM	Infant holds 1 toy in each hand for 3 seconds or more.	
6m	Interest in sound production	Child intentionally uses objects to make noise.	

COGNITIVE DEVELOPMENT

- SCHEMES FOR RELATING TO OBJECTS -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
6-8m	Transfers object from one hand to the other *FM		
6-8m	Brings feet to mouth		
7-10m	Uses schemes that are appropriate to properties of objects	Infant shakes bell, dials phone, bangs drum.	
9-12m	Manipulates object with interest in details	Infant intently examines details of object by feeling, tasting, etc.	Norris et al. 9m >25% 12m >75%
9-12m	Accepts different textures		

COGNITIVE DEVELOPMENT

- SCHEMES FOR RELATING TO OBJECTS -

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
12-18m	Uses objects with similar properties in similar ways	Child rolls round objects, bangs combinable objects.	
15-18m	Social uses of objects	Child uses objects in socially appropriate manner (e.g., combs hair with hairbrush, brushes teeth with toothbrush, drinks from cup).	
18-24m	Categorizes objects according to shape	Child is presented with 4 objects--2 of which are similar in shape--child groups objects that are same shape.	

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FINE MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
5m (4-8m)	Partial thumb opposition	Child picks up and holds object using palm as well as thumb and fingers.	
6m (4-8m)	Transfers object hand to hand. *C		Norris et al. 6m > 25% 9m > 75%
6m	Unilateral reaching	Child reaches for objects with 1 hand.	
6m (4-8m)	Rotates wrist	Child rotates wrist freely in manipulating toys.	
6m	Uses hands to reach, grasp, crumple, bang, and splash.		
6-9m	Scooping	Object is placed within easy reach of child (is tapped to attract child's attention). Child secures object with raking or scooping motion.	

FINE MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
9-12m	Grasps with thumb and finger	Child consistently opposes thumb to other 4 fingers in picking up or holding objects.	Norris et al. 6m > 25% 9m > 50% 12m > 75% Maxfield-Buchholz 0-12m 48% 12-24m 86%
10-16m	Midline skill	Child brings hands together at midline.	
12m	Releases objects	Child can voluntarily release objects in mid-air.	Norris et al. 6m < 25% 9m > 25% 12m > 75% Maxfield-Buchholz 0-12m 56% 12-24m 91%
12-15m	Partial finger prehension	Child picks up object with several fingers opposed to thumb rather than by scooping.	

FINE MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
12-16m	Hand preference	Child reaches for objects with same hand most of the time.	Norris et al. 6m < 25% 9m >50% 12m >75%
14-17m	Fine prehension	Child picks up object with thumb and forefinger.	
16-20m	Throws ball		

GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
1-2m	Lifts head	While lying face down, infant frees face by turning head to side or by lifting it up.	Norris et al. 6m > 75%
2m (1-5m)	Turns from side to back		
2-4m	Balances head	While held, infant can hold head erect for 15 seconds.	Norris et al. 6m > 75% Maxfield-Buchholz 0-12m 97% 12-24m 99%
3-6m	Hold head steady	While being carried, infant holds head erect.	
4-10m	Elevates self by arms	From prone position, lifts head and shoulders up by arms.	Fraiberg 4.5-9.5m range 8.75 median
4-10m	Rolls from back to stomach		Fraiberg 4.5-9.5m range 7.25 median

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GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
5m	Pivots while on stomach		
5-6m	Sits with slight support	Sits alone or with slight support.	
6-8m	Effort to sit	While lying on back, infant attempts to raise his head and shoulders.	
7m	Early stepping movements	Child is held under his arms. Child makes stepping movements which propel him forward.	
8m	Sits alone, steadily		Fraiberg 6.5-9.5m range 8.0m median Norris et al. 9m > 25% 12m > 75% Maxfield-Buchholz 0-12m 49% 12-24m 81%

GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
8m (5-12m)	Pulls to standing position	With assistance, child pulls self to standing position. (from supine position)	Norris et al. 6m > 25% 12m > 50% 15m > 75% Maxfield-Buchholz 0-12m 38% 12-24m 83%
8-10m	Crawls backwards	Child pushes self with hands (more than feet) and goes backwards.	
9m (6-12m)	Walks with assistance	With support for balance, child makes coordinated stepping movements.	Fraiberg 8.0-11.5m range 10.75m median Norris et al. 9m < 25% 12m > 50% 18m > 75%
9-11m	Raises self to sitting position	Infant pulls himself into sitting position from supine position.	Fraiberg 9.5-15.5m range 11.0 median

GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
9-16m	Stands alone	Once child is placed into standing position, child maintains standing position for short time.	Fraiberg 9.0-15.5 range 13.0m median Norris et al. 12m < 25% 15m > 25% 18m > 50% 24m > 75%
12m	Creeps over barrier	Child can creep over slight barrier.	
12m	Sits and pivots	While sitting, infant can turn self around.	
12-15m	Stoops to recover object from floor with support	Child bends down while holding some support, picks up object off floor, and returns to standing position.	

GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
12-15m	Walks with slight help	With slight help, child walks.	Norris et al. 9m <25% 15m >25% 18m >50% 24m >75%
12-15m	Sits down	Child lowers himself from standing to sitting position without falling.	Norris et al. 6m <25% 12m >25% 15m >50% 21m >75% Maxfield-Buchholz 0-12m 14% 12-24m 64%
12-18m	Walks sideways when holding furniture		Norris et al. 9m <25% 12m >25% 15m >50% 18m >75% Maxfield-Buchholz 0-12m 2% 12-24m 63%

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GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
12-19m	Walks alone	Child takes a few steps without assistance.	Fraiberg 11.5-19.0 range 15.25m median Norris et al. 12m < 25% 18m > 25% 21m > 50%
12-20m	Walks alone, across room	Without support, child walks width of ordinary room.	Fraiberg 12.0-20.5m range 19.25m median Norris et al. 15m < 25% 18m > 25% 24m > 50% Maxfield-Buchholz 0-12m 0% 12-24m 18%
14-18m	Stands up by furniture	Child uses object to raise himself into standing position.	Norris et al. 9m < 25% 12m > 25% 15m > 50% 18m > 75% Maxfield-Buchholz 0-12m 8% 12-24m 64%

GROSS MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
16-20m	Climbs up stairs	Child uses hands and knees or hands and feet to climb up stairs.	
18-24m	Stands up from supine position	Child is placed on back on floor and requested to get up. Child rolls onto stomach and then stands up without upright support to pull himself up.	
18-24m	Goes about house or yard holding onto objects	Independent of other people, child goes about house or yard alone. Child may occasionally hold onto objects.	Norris et al. 12m < 25% 18m > 25% 21m > 50%
20-24m	Stoops and recovers	Child can return to standing position after stooping.	
22-24m	Walks up stairs with help	Child walks up stairs holding wall or rail for support.	Norris et al. 15m < 25% 18m > 25% 24m > 50%

FINE MOTOR DEVELOPMENT

EXPECTED AGE	ITEM	CLARIFICATION	AVAILABLE DATA
1m	Retains object	Object is placed in child's hand. Child retains hold on object.	
2-7m (1-6m)	Hands predominantly open	When child is not grasping object his hands are open more than half the time.	Norris et al. 6m > 75%
3m (1-6m)	Fingers hand in play. *C	Child playfully fingers one hand with other.	Norris et al. 6m > 75%
4m	Ulnar-palmar prehension	Small object is picked up by child or placed in child's hand. Child holds object by his fingers against heel of palm.	
4m	Brings objects to mouth		
5m (3-7m)	Retains 2 objects *C	Child holds objects for 3 seconds or more, 1 in each hand.	

ASSESSMENT OF HOME ENVIRONMENT

- When child verbalizes, parents respond to child's intent in ways child understands.
- Parents respond in positive and accepting ways to child's actions and provide appropriate feedback to child to encourage or discourage these actions.
- Parents respond appropriately to child's distress.
- Parents demonstrate physical affection towards child.
- Parents provide appropriate limitations without unduly interfering with or restricting child.
- Parents do not express hostility towards child.
- Physical punishment of the child is limited and appropriate.
- Parents consciously encourage appropriate developmental advances.
- Parents adjust appropriately to interaction style of child.
- Parents and child derive pleasure from their interactions.

- Parents provide appropriate play things that challenge child to develop new skills.
- Parents engage in play with child at least once a day.
- Child is included in family outings.
- Opportunities are provided for the child to interact with other adults and children outside the family.
- Other caregivers are available besides parents.
- Parents receive sufficient support from family and/or friends.

- Child's physical needs are attended to appropriately.
- Child's home environment is safe.
- Child's play things are kept in a consistent location and are accessible to the child.
- A variety of play things are introduced and available to the child.

ASSESSMENT OF HOME ENVIRONMENT

- Parents have realistic expectations for the development of independence and autonomy of their child.
- Parents generally have a positive conception of their child despite day to day frustrations.
- While parents may be dealing with problems associated with their handicapped child, they generally maintain a positive self image.

REVIEW OF RESEARCH PERTAINING TO THE ASSESSMENT OF INFANTS WITH VISUAL IMPAIRMENT

by

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June, 1984

This study was supported by a Special Study grant (01-03651-X850-00-83) from the Special Needs Division, California State Department of Education. Findings, conclusions, and other opinions expressed in this report are those of the authors and they do not reflect the official position of the California State Department of Education nor of the sponsoring agency, and no endorsement is implied.

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INTRODUCTION

In recent years, as researchers have begun to study the development of atypical populations, it has been discovered that the rate of development as well as the route followed by these children may differ from that of intact children. One group of children whose development is significantly affected by their impairment is the visually handicapped (Fraiberg, 1977; Warren 1977). An understanding of developmental milestones specific to visually impaired children is crucial in the planning of intervention strategies by professionals working with these children. Realistic expectations for blind or visually impaired children can positively affect these children's growth and adjustment within the family (Kastein, Spaulding, & Scharf, 1980).

Under optimal conditions, healthy children with little or no vision are able to adapt to their vision loss through the successful coordination of remaining systems, attaining many of the developmental achievements of their sighted peers albeit using different routes (Fraiberg, 1977; Norris, Spaulding, & Brodie, 1957). Unfortunately, for many blind children, the adaptive solutions to vision loss are elusive. Without adequate support and guidance from family and specialists, these children with visual impairment can experience severe developmental delays. Since the immediate and long-term effects of early visual impairment on children and their families can be devastating, it is critical that children with little or no vision be accurately assessed so that intervention can be implemented as early as possible and address crucial developmental needs.

Thus, the California State Department of Education funded a project to develop assessment guidelines for visually impaired infants from birth to 24 months. An examination of assessment instruments for visually impaired infants indicated that there was no comprehensive assessment tool available that incorporated current theories of child development and recent empirical findings concerning the growth patterns of infants with vision loss. The review of the literature revealed that extensive research had been performed over the past 10 years on language development of blind infants, but other areas of growth had received far less attention. This presented a dilemma: How could assessment guidelines be prepared that would aid intervention programs when so little empirical information was available concerning typical developmental patterns of visually impaired infants? Rather than move quickly forward with the preparation of an assessment scale, it was decided to move more slowly in order to place assessment issues into proper perspective. It would first be necessary to describe what is known about the development of visually impaired infants and identify areas of concern where more research is needed. This approach would achieve several goals. It would 1) document the development of visually impaired infants, 2) discuss critical issues that require further investigation where available evidence is minimal or contradictory, 3) examine developmental areas that have not been addressed with respect to the visually impaired but which warrant further investigation, 4)describe the effects of the social and physical environment on the development of visually impaired infants, and 5) stress the interrelationship of developmental areas. This information would provide the direction for further research

and would also define important issues for clinicians.

The chapters that follow present a review of the research in several areas: social competence, communicative competence, cognition, and play. From the review, it has become clear that a social environment that is encouraging and satisfying to infants and their families is a primary facilitator of progress in all developmental domains. With a solid affective base, optimal growth in language and cognition can occur. Play has been treated in a separate chapter since it encompasses skills and behaviors in all areas of development and lends itself readily to assessment. It is anticipated that these chapters will require periodic revision to incorporate new research and theories as they arise. Chapters addressing motor development and functional vision are needed and will be added later in a follow-up study.

Each chapter describes current theories with respect to intact infants and then reviews the research completed with the visually impaired. Relevant findings from research conducted with infants with other handicapping conditions have also been presented. Every effort has been made to include reseach that has potential clinical application for visually impaired infants and their families. At the end of each chapter, general guidelines for the assessment of visually impaired infants are provided. These guidelines discuss factors crucial for assessment and suggest methods for their evaluation.

Some general points about research conducted with the visually impaired infants should be made. Much of our knowledge of the development of visually impaired infants comes from two major longitudinal studies completed by Norris, Spaulding, and Brodie

(1957) in the 1950s, and by Fraiberg and her colleagues in the 1960s (Fraiberg, 1977). Norris et al. studied 66 children intensively from identification of vision loss in infancy until 7 years of age. The researchers utilized the Cattell Infant Intelligence Scale (Cattell, 1940) and the Maxfield-Fjeld Scale of Social Maturity (Maxfield & Fjeld, 1942) as well as detailed case studies. Among their many findings, they identified three factors that characterized children who demonstrated optimal growth -- independence, initiative, and active exploration of the environment. Methods to assess skills and behaviors that promote these characteristics at various developmental stages in infancy have yet to be elaborated. Norris et al. also found the totally blind infant to be particularly dependent upon favorable opportunities for optimal development, thus emphasizing the importance of the social and physical environment for this population. Fraiberg and her associates studied 10 infants with vision loss from birth who had no additional handicaps and who participated in a strong intervention program. Their research addressed issues pertaining to gross motor development, fine motor development, human attachments, language acquisition, and cognition. While comparing blind and sighted infants, Fraiberg became aware of behaviors that were uniquely adaptive for the congenitally blind and as a result emphasized a different course of development for this population in some growth areas. Much of the recent research with visually impaired infants has been generated by investigators interested in the development of communicative competence, studying children with vision loss for comparative purposes. This will be described in detail in the chapter on communicative competence. Research pertaining to

cognition, play, motor development, and the development of functional vision for those infants with residual vision has been extremely limited.

Studies with visually impaired infants have exhibited some common limitations in their application to assessment. They often involve a small number of subjects which limits the generalizability of the findings. This is, in part, a function of the small percentage of visually impaired infants with no additional handicaps usually required for research. In addition, results of studies of visually impaired infants with no additional handicaps cannot be directly applied to infants with multiple handicaps since the additional impairments are likely to affect development. Results concerning the totally blind infant cannot be applied to those with some remaining vision since the smallest amount of vision alters developmental patterns. In fact, little research has been conducted with infants with some remaining vision. Finally, research designed to compare visually impaired infants with sighted peers has often concentrated on behaviors necessary for optimal development of the sighted while overlooking unique behaviors that could be extremely important to the visually impaired.

While only a beginning, this work is intended to demonstrate the need to understand the many factors that affect and promote optimal growth of infants with visual impairment. The ultimate goal is to sensitize parents, professionals, and researchers to critical issues pertaining to visually impaired infants and to stimulate further investigation.

References

Cattell, P. (1940). The measurement of intelligence of infants and young children. New York: The Psychological Corporation.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Kastein, S., Spaulding, I., & Scharf, B. (1980). Raising the young blind child. New York: Human Sciences.

Maxfield, K.E., & Fjeld, H.A. (1942). The social maturity of the visually handicapped preschool child. Child Development, 13, 1-27.

Norris, M., Spaulding, P.J., & Brodie, F.H. (1957). Blindness in children. Chicago: University of Chicago Press.

Warren, D.H. (1977). Blindness and early childhood development. New York: American Foundation for the Blind.

THE DEVELOPMENT OF SOCIAL COMPETENCE

In recent years there has been less emphasis on the use of cognitive performance as the sole predictor of current and future functioning of handicapped children and increased attention paid to social development (McHale & Olley, 1982). The promotion of optimal social development for infants with vision loss is critical since visually impaired children are particularly dependent upon other people to learn about the environment (Norris, Spaulding, & Brodie, 1957). This chapter will examine the development of positive social relationships between blind infants and their caregivers. The attachment bond and positive social interactions which have been documented as critical to the development of intact children may be of special importance for observation, assessment, and intervention with the visually impaired.

Development of Positive Social Relationships

"It is only within satisfying relationships that the [visually impaired] child is able to move out to broaden experience" (Norris et al.,1957, p.72). Bromwich (1976) stresses that a mutually satisfying relationship between mother and infant is the primary requisite for optimal development. Merely teaching mothers how to play with their babies, however, has minimal impact on development. This coincides with the claim of Norris et al. (1957) that parents should not be expected and trained to teach specific skills to their children without emphasis on the development of positive relationships.

Positive relationships begin in early infancy with caregivers understanding infants' needs and appropriately responding to behaviors such as smiling, crying, and vocalizing. As an infant's behavior becomes more complex and understandable and as significant caretakers become more identifiable to the child, an affective bonding occurs. The affective bond between an infant and an adult is referred to as attachment in psychoanalytic theory. This bond serves to maintain and increase infant-adult proximity (Waters & Deane, 1982). Ainsworth and Wittig (1969) postulate that attachment develops in combination with the development of competence through exploration and manipulation. In their study of 14 infants, the authors suggest some elements in mother-infant interaction that contribute to the growth of healthy atttachment. These include frequent and sustained physical contact, the ability to soothe a distressed baby through physical contact, sensitivity to the baby's signals, and the ability to time interactions in harmony with the baby's rhythms. In addition, the baby should be able to derive a sense of the consequences of his or her actions which have predictable effects and that promote feelings of efficacy. Freedom to explore and to learn also promote healthy attachment as does the mutual delight of mother and infant in their interactions. Although the majority of research on attachments has focused on mother-child relationships, Lamb (1980) has demonstrated that infants are also attached to fathers from early in life.

Social Interaction In Normal Infants

A positive affective bond develops through the everyday social

exchanges of infants and their caregivers. In an analysis of social interaction between parents and toddlers aged 16 to 22 months, Vandell (1975) found a number of developmental advances. For example, the proportion of vocalizations increased for both parents and children as the infants matured. Changes were found in the vocalizations employed by mothers and fathers; the frequency of questions, didactic utterances, and negatives increased significantly while one-word imperatives decreased. Other analyses considered the complexity of social acts and the effectiveness of social acts. Here it was found that toddlers' use of effective social behaviors and the complexity of their social behaviors increased with age. Although parents initiated most of the social interactions, the toddlers' initiations increased with age. Percent of time in interaction and mean duration of interaction increased with age.

Gunnar and Donahue (1980) also noted changes in social interaction with increasing age and found that it was the infants' behaviors rather than maternal behaviors that regulated these changes. As infants matured and their behavior changed (e.g., they initiated more social acts), caregivers altered their behaviors accordingly.

Established in early caregiver-child interactions are elements that facilitate development in language and cognition. These include 1) caregivers' use of language readily understood by the infant, 2) turn-taking, 3) careful monitoring of signals and rhythms, and 4) use of contingent responses (Field, 1980).

Social Interactions of Visually Impaired Infants

While the coordinated interactions of parent and child are necessary for the development of positive social relationships, these can be adversely affected by prematurity or congenital anomalies (Field, 1980). This is especially true for infants with vision loss considering the role of vision in early social exchanges. The visually impaired infant has a limited range of responses which may not facilitate responses by caregivers. Furthermore, some infants with vision loss are premature and cannot return home from the hospital immediately, (Norris et al., 1957). Premature infants, in general, are often difficult to handle due to patterns of behavior established in intensive care units (Gorski, 1982).

A number of studies have investigated the early social behavior of visually impaired infants. The effects of restricted smiling behavior and lack of eye contact have been discussed by several researchers (Fraiberg, 1975; Freedman, 1964; Urwin, 1978). Although blind infants do smile, their smiles are fleeting, appear muted, and do not serve as initiators of social interactions. Some families are able to accommodate such differences. For example, one mother of an infant with residual vision in a study by Urwin (1978) reported that her infant's smile was one of the most effective methods by which her child acknowledged her. Als, Tronick, and Brazelton (1980) report pronounced smiling in a blind infant at 4 1/2 months of age when engaged in pleasurable interaction with her mother. Eye contact and gaze aversion are primary initiators and terminators of social exchanges for very young normally seeing infants. Lack of eye contact can often be misinterpreted by caregivers as lack of interest on the child's part

and may terminate social interaction. Eye contact as a means to initiate social exchanges is not available to blind infants or their caregivers.

Gestures are a means to initiate social interaction, and Fraiberg (1977) found a delay in the appearance of gestures for "hold me" and "pick me up" in her group of blind infants. Urwin (1978) also reported a delay in the use gestures by a child with residual vision.

Social exchanges are also accomplished through the use of language. Spontaneous vocalizations were limited for the blind infants in the Fraiberg study (1977) during the first year. On the other hand, Rowland (1980) did not find a difference in the amount of spontaneous vocalizations of her visually impaired subjects. She did, however, report that blind children vocalize significantly less often than sighted children in response to their mothers' input. The type of language input to blind children from caregivers has also been found to differ from language provided to sighted children. Caregivers of blind children use more declaratives and imperatives as well as persist in labeling objects and people while using fewer descriptors (Andersen & Kekelis, 1982; Kekelis, 1981). Urwin (1978), in a detailed examination of communication development in 2 visually impaired infants found that the mother of a child with usable vision provided toys in response to her child's cries for attention while the mother of a blind infant tended to pick up her baby.

Social Play

Play fosters the development of social competence in children.

Through play a caregiver is able to sustain his or her infant's attention so that a new skill can be learned or a learned skill can be practiced. Infant play with a caregiver is governed by the child's cognitive, social, and motor abilities as well as by the caregiver's ability to respond appropriately to the infant's behaviors. Caregivers choose games that draw upon their childrens' sensorimotor abilities and that can be mutually enjoyed. For younger infants, simple stimulation games predominate. This changes with increasing age as games become more complex and involve more infant participation (Crawley et al., 1978; Gustafson et al., 1979). Games can be defined as predictable, reciprocal patterns of behavior (McHale & Olley, 1982). They represent about 10% of all social interactions for infants up to 12 months of age, and provide infants opportunities to control and eventually predict adult behaviors (Gustafson et al., 1979). In the social context of games, infants begin to learn rules for social interaction. Not only do infants learn the rules of routinized games, they also learn to use the rules to initiate variations in the games (Bruner & Sherwood, 1976). Furthermore, infants learn the reciprocal nature of social interaction through games. An examination of the structure of caregiver-infant games can serve as an index of infants' social skills and caregivers' ability to respond appropriately to their children. Since games occur regularly in everyday activities, they can be examined over time in terms of stability, frequency, and content (Gustafson et al., 1979) and lend themselves readily for assessment.

Dunn and Wooding (1977) examined the social context of play for older infants, 18 to 24 months of age. They found that the median length of play sessions increased significantly when mother and child jointly attended to the object of the child's play. In play with

objects initiated by the child, the child involved the mother in only 5% of the cases. When the child initiated a pretend play activity, however, the child involved the mother or was already involved with the mother in the majority of cases. Thus maternal involvement in play can affect duration of play sessions and type of play of intact infants.

Maternal involvement in play has been found to differ in handicapped and non-handicapped infants. Brooks-Gunn and Lewis (1982) compared social play in handicapped and non-handicapped infants aged 3 to 36 months. They found that mothers of normal infants played with toys much less frequently than mothers of handicapped infants of equivalent age. These mothers were also less likely to demonstrate toys than mothers of handicapped infants, and they were less likely to give toys to their children than mothers of handicapped infants. Normal children spent more time playing alone with toys than handicapped children and their interactive play increased with age. The interactive play of handicapped children, which was almost always initiated by the mothers in the first year, decreased as the infants began to initiate more toy play alone and did not involve their mothers. These differences in toy play could arise from different expectations of mothers for their handicapped infants, with mothers attempting to facilitate toy play in the handicapped group at early ages. Infant characteristics may also determine the nature of play interactions. McHale and Olley (1982) contend that atypical behavior of handicapped or at-risk infants may negatively affect the development of mutually satisfying mother-infant play.

Few studies have examined the social play of blind infants. It is possible that different behaviors of blind and visually impaired infants would result in variations in their social play. Mothers of 2

infants in the Urwin (1978) study reported that their children were unable to keep themselves occupied. These mothers, in turn, felt responsible for initiating activities and interactions with their infants. They combined repetitive speaking and/or touching to maintain their babies' attention. Urwin reports that many forms of play became ritualized; once the mothers found something that worked they used it repeatedly. By 8 months, mother-initiated, simple repetitious routines gave way to ones that were longer and involved more active participation and anticipation by the infants. The infants attempted to restart and prolong routines by 1 year. At this time mothers began to substitute elements from one routine to another and to make more demands on their babies. As the infants developed, particularly in mobility, new forms of play appeared and many early established routines disappeared. For both infants in the Urwin study, the parents initiated the most social play at the end of the first year, although both infants were taking an increasingly dominant role in sustaining routines. By the second year, the infants introduced variations in the routines in a wider range of situations.

In a study of play and language in a pair of blind and sighted twin infants, Sokolow (1983) found that the blind twin at 18 months initiated little interaction with her mother and engaged mostly in solitary play with toys. By 24 months, the blind twin checked her mother's location through conversation. Her play with toys became more varied and brief. On the other hand the sighted twin at 18 months frequently returned to her mother's lap to express her needs. By 24 months the sighted twin engaged in more concentrated exploratory play with objects, showing toys to her mother from a distance.

These studies do suggest differences in the social interaction

patterns of blind infants; however, they dealt with a few children and did not examine the many issues surrounding social interactions in depth. Additionally, it must be remembered that what may be appropriate behavior for a normally sighted infant may not be adaptive for a visually impaired infant. This is exemplified by the different ages in which solitary play predominated for the twins in the Sokolow (1983) study. More research is needed to increase our understanding of social interaction and social play of visually impaired infants.

Attachment Behaviors

Attachment bonds, necessary for the development of positive social relationships, are inferred from the existence of attachment behaviors. These behaviors bring infants closer to adults or encourage adults to sustain or initiate encounters with infants. They include crying upon separation, exploring from a secure base, and approach through locomotion (Lamb, 1980). The assessment of attachment for handicapped children is important since the quality of this bond can affect the development of family dynamics which in turn affects caregiving, family accord and discord, as well as family collaboration with community service providers (Blacher & Meyers, 1983).

In the development of attachment, infants first differentiate the mother and other significant people from strangers at about 6 months. Soon after this, the absence of the mother (or father) and presence of a stranger produces distress as the child develops the concept of the permanent and independent existence of other persons (Lamb, 1977). The use of an experimentally staged "strange situation" in which the mother

leaves the child alone, then alone with a stranger, and then returns is a common way to elicit and measure attachment behaviors (Ainsworth & Wittig, 1969). Others have sought to examine attachment behaviors through naturalistic observations of situations in which attachment behaviors are evident during the course of home visits (Fraiberg, 1971).

Fraiberg (1971, 1977) examined attachment behaviors of the 10 blind infants in her longitudinal study. Separation protest and distress was noted at a median age of 11 months 20 days, which indicated a 6-month lag for the blind infants in comparison with sighted infants. This delay was thought to be related to the delay in the attainment of the concept of mother as object. Proximity-seeking behaviors towards the mother's voice emerged at 10 to 16 months with the development of the concept of mother as a permanent object. Negative reactions to strangers occurred within ranges for sighted children at 7 to 15 months. Returning to the mother as a secure base and displaying distress when the mother could not be located was noted in the second year as mobility increased. Thus, in the development of human attachments, the infants in Fraiberg's study displayed attachment behaviors similar to sighted infants, with a delay in some behaviors due to delays in attainment of the concepts of person and object permanence. The infants in Fraiberg's study were advantaged, however, in that they benefited from a guidance program designed to promote positive relationships, and they had no additional handicaps (Blacher & Meyers, 1983). Similar data for infants without the advantages of a guidance program or for infants with additional handicaps are not available. It is likely that attachment will be more delayed in these children. Also not available are equivalent data for children with

limited, but usable vision, although it is expected that their attachment behaviors will be similar to those of intact infants.

The use of a modified version of the Ainsworth-Wittig strange situation paradigm to assess attachment behaviors of handicapped children has been proposed by Blacher and Meyers (1983). This assessment methodology affords more readily interpretable results that can be translated into clinical recommendations and allows for examination of behavior over time. Modifications for the handicapped population can include the use of observations in the home rather than the laboratory, alternative communication strategies by the mother to announce her presence, and timing adjustments for children who may be delayed in their responses.

Rather than focusing on infant behavior, Bromwich (1976) addresses the role of maternal behavior in the assessment of social interactions. The analysis of maternal behaviors lends itself readily to the development of intervention strategies. Bromwich's intervention program rests on the premise that later stages of appropriate reciprocal behaviors of mother and infant emerge from a mutually satisfying affective base. This concurs with conclusions drawn from the two major studies conducted with visually impaired infants to date (Fraiberg, 1977; Norris et al., 1957). In the Bromwich assessment (1976) maternal behaviors are examined as a progression of six steps which can be easily applied to visually impaired infants and their caregivers. They center around mutual enjoyment of mother and infant, maternal sensitivity and responsivity to her infant, and suitability of play activities and materials.

Assessment of Social Competence

The establishment of a positive affective base from which effective social relationships can grow can be difficult for some visually impaired infants and their caregivers. Often, the interaction patterns and social signals of these infants differ and must be carefully explained to caregivers in order to achieve a positive bonding (Fraiberg, 1977). The patterns that exist must be examined for their appropriateness within the context of the caregiver-infant pair. What may be adaptive behavior for one pair may not be adaptive for another. Furthermore, adaptive behavior for a caregiver-infant pair at one point in time may not be adaptive at another point in time. In some instances, behaviors that were once appropriate become maladaptive when exchanges become overly routine without variations or expansions that promote social and cognitive growth. Without firm data regarding developmental expectations for visually impaired infants, especially those with additional handicaps, it is impossible to provide assessment guidelines elucidating developmental progressions, let alone age level expectations. It is possible, however, to generate a set of questions that should be considered on a case by case basis when examining the development of social competence for an infant with vision loss.

1. Has a positive affective base been established between mother and infant? Use of the Bromwich assessment protocol (1976) could be valuable here.
2. In what ways is the infant expressing needs, wants, and feelings? Examine vocal and motor channels. Look for alternatives to usual means of expression used by sighted children.

3. Are the infant's caregivers aware of the ways in which the child is expressing needs, wants, and feelings? Do they provide ample time between turns for the child to respond?

4. Are the caregivers providing opportunities for the infant to express needs, wants, and feelings?

5. What are the caregivers' social expectations for the infant at various ages and are they realistic?

6. Are the caregivers' responses in synchrony with the infant's communicative attempts so that interactions are appropriately initiated and maintained? How does the infant communicate, and why are communication attempts successful or unsuccessful?

7. Are the infant's responses in synchrony with the caregivers' communicative attempts so that interactions are appropriately initiated and maintained? How does the caregiver communicate, and why are communication attempts successful or unsuccessful?

8. Has the infant achieved the concept of caregiver as a permanent object? This may lead to increased interaction with caregivers when not in proximity as well as the demonstration of attachment behaviors.

Based upon this information, a greater understanding of interaction patterns for a particular caregiver-infant pair can be achieved. The issue of appropriate intervention, however, is a sensitive one since the developmental patterns of social interactions and relationships for visually impaired infants at this time are not well understood. It is not clear that the patterns observed for normally sighted infants should be promoted. Until more research has been completed, the following factors should be considered for intervention programs:

1. When interactions are noted that are not synchronous, effort should be made to facilitate harmony between the caregiver-child pair. For example, caregivers may be persisting too long in activities (Rowland, 1980), or infants may be using signs that are not readily deciphered by their caregivers (Fraiberg, 1977).

2. The appropriate amount and content of interaction between a caregiver and infant should be promoted, given the interaction styles of each at a certain point in time. Social interactions that are mutually satisfying can be promoted during common daily activities such as feeding, bathing, and changing.

3. Note when social interactions become overly routine without variations or expansions offered by either the caregiver or the infant. Develop strategies to promote minor variations which can extend cognitive and social growth while recognizing the importance of routines as a means of establishing a firm set of expectations and from which pleasure can be derived for both the infant and caregiver.

References

Ainsworth, M.D.S., & Wittig, B.A. (1969). Attachment and exploratory behavior of one-year-olds in a strange situation. In B. Vors (Ed.), Determinants of infant behavior (Vol. 4). London: Metheun.

Als, H., Tronick, E., & Brazelton, T.B. (1980). Affective reciprocity and the development of autonomy. American Academy of Child Psychiatry,19, 22-40.

Andersen, E.S., & Kekelis, L.S. (1982, October). The role of visual perception in early caregiver-child communication: Some "input" from the blind. Paper presented at the Seventh Annual Boston University Conference on Language Development.

Blacher, J., & Meyers, C.E. (1983). Review of attachment formation and disorder of handicapped children. American Journal of Mental Deficiency,87, 359-371.

Bromwich, R. (1975). Focus on maternal behavior in infant intervention. American Journal of Orthopsychiatry,46, 439-446.

Bruner, J.S., & Sherwood, V. (1976). Peekaboo and the learning of rule structures. In J.S. Bruner, A. Jolly, & R. Sylva (Eds.), Play: Its role in development and evaluation (pp. 277-285). New York: Basic Books.

Crawley, S.B., Rogers, P.P., Freedman, S., Iacobbo, M., Criticas, A.,

Richardson, L., & Thompson, M. (1978). Developmental changes in the structure of mother-infant play. Developmental Psychology,14, 30-36.

Dunn, J., & Wooding, C. (1977). Play in the home and its implications for learning. In B. Tizard & D. Harvey (Eds.), Biology of Play. Clinics in developmental medicine ser.: (Vol. 62) (pp. 45-58). Philadelphia: Lippincott.

Field, T. M. (1980). Interactions of high-risk infants: Quantitative and qualitative differences. In D. Sawin, R. Hawkins, L. Walker, & J. Penticuff (Eds.), Exceptional infant: Psychosocial risks in infant-environment transactions (Vol. 4) (pp. 120-143). New York: Brunner/ Mazel.

Fraiberg, S. (1971). Separation crisis in two blind children. Psychoanalytic Study of the Child,26, 355-371.

Fraiberg, S. (1975). Development of human attachments in infants blind from birth. Merrill-Palmer Quarterly,21, 315-334.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Freedman, D.G. (1964). Smiling in blind infants and the issue of innate vs. acquired. Journal of Psychology and Psychiatry,5, 171-184.

Gorski, P.A. (1982). Premature infant behavioral and physiological

responses to caregiving interventions in the intensive care nursery. In J. Call & E. Galenson (Eds.), Frontiers of infant psychiatry. New York: Basic Books.

Gunnar, M.R., & Donahue, M. (1980). Sex differences in social responsiveness between six months and twelve months. Child Development,51, 262-265.

Gustafson, G.E., Green, J.A., & West, M. (1979). Infant's changing role in mother-infant games: The growth of social skills. Infant Behavior and Development,2, 301-306.

Kekelis, L.S. (1981). Mothers' input to blind children. Unpublished master's paper, University of Southern California, Los Angeles.

Lamb, M.E. (1977). Father-infant and mother-infant interaction in the first year of life. Child Development,48, 167-181.

Lamb, M.E. (1980). Development of parent-infant attachments in the first two years of life. In F.A. Pedersen (Ed.), Father-infant relationship. New York: Praeger.

McHale, S.M., & Olley, J.G. (1982). Using play to facilitate the social development of handicapped children. Topics in Early Childhood Special Education,2, 76-86.

Norris, M., Spaulding, P.J., & Brodie, F.H. (1957). Blindness in children. Chicago: University of Chicago Press.

Rowland, C.M. (1980). Communicative strategies of visually impaired infants and their mothers. Unpublished doctoral dissertation, University of Oklahoma.

Sokolow, A. (1983). Differences in play and language development in a pair of blind and sighted twin infants. In M.E. Mulholland & M.V. Wurster (Eds.), Help me become everthing I can be. Proceedings of the North American Conference on Visually Handicapped Infants and Preschool Children (pp. 117-122). New York: American Foundation for the Blind.

Urwin, C. (1978). Development of communication between blind infants and their parents: Some ways into language. Unpublished doctoral dissertation, University of Cambridge, Cambridge.

Vandell, D.L. (1979). A microanalysis of toddlers' social interaction with mothers and fathers. Journal of Genetic Psychology, 134, 299-312.

Waters, E. & Deane, K.E. (1982). Infant-mother attachment: Theories, models, recent data, and some tasks of comparative developmental analysis. In L.W. Hoffman, R. Gandelman, & H.R. Schiffman (Eds.), Parenting: Its causes and consequences. Hillsdale, NJ: Lawrence Erlbaum.

THE DEVELOPMENT OF COMMUNICATIVE COMPETENCE

Infancy is a critical period in the development of communicative competence. During their first 2 years, children learn not only the words to name important persons, objects, and events in their lives, but also the means to engage in satisfying interaction. Visual information plays an important role in the early stages of language development. The visual input of gaze and gestures along with contextual information obtained through the visual sense help children convey messages successfully and understand the speech of others. There are children, however, who learn to talk without the help of visual information. Recent studies suggest that the language development of blind children may differ significantly from the development already documented for sighted children (Andersen, Dunlea, & Kekelis, in press; Dunlea, 1982; Rowland, 1980; Urwin, 1978). Since language is an important method by which visually impaired children learn about the world, it is critical that its development be documented for assessment and intervention purposes. This chapter will review a number of recent studies of language development of intact and at-risk children, in particular, the visually impaired. On the basis of the research findings, guidelines for assessing the communicative competence of infants with little or no vision will be proposed.

Early Social Interaction

Language development begins long before a child utters his or her first words. During the first year of social interaction, infants

learn how to attract and direct the attention of their caregivers with gesture and eye gaze. A number of investigators have proposed that infants learn to communicate because their caregivers meaningfully interpret their visually perceptible behavior (e.g., gesture, smiles, gaze) (Newson, 1979). From their caregivers' responses, infants learn, for example, that smiles may serve as greetings to initiate interaction and that reaches for distant objects may serve as requests.

During the games they play with their caregivers--those that involve repetition of tactile and verbal routines such as pat-a-cake and peek-a-boo--infants learn the elementary rules for initiating and maintaining interaction (Bruner & Sherwood, 1976). Initially, infants are encouraged to respond with just a smile or eye contact. Later, they are expected to provide more elaborate responses such as a line of verse in a routine.

Successful interaction benefits both infant and caregiver. When caregivers interpret their children's behavior and respond appropriately, they maintain their infants' attention and elicit positive responses. These infant responses increase caregivers' feelings of effectiveness and help them to continue to support their children's growth (Goldberg, 1977). There are, however, infants who are unreadable and unpredictable to their caregivers. Since it is difficult and, at times, impossible to respond appropriately to these infants, their caregivers are likely to feel inadequate and helpless. A history of repeated communication breakdowns between these infants and their caregivers often develops. As a result of ineffective social interaction, some caregivers resort to intrusive and restrictive language (Field, 1980; Rocissano & Yatchmink, 1983; Schlesinger, 1972). Field (1980) reported that premature infants ignore such input, a

response that may elicit even more intrusive language from mothers.

Early Interactions Between Blind Infants and Their Caregivers

Families that might not be able to engage in positive social interaction are those in which there is a visual impairment. During infancy, when parent-child interaction is particularly dependent on visual cues, blind children are at a disadvantage. Visual impairment makes it difficult for infants to elicit appropriate input:

> The blind eyes that do not engage our eyes, that do not regard our faces, have an effect upon the observer which is never completely overcome. When the eyes do not meet ours in acknowledgement of our presence, it feels curiously like a rebuff . . . the absence of eye contact gives the negative sign of "no interest." The absence of a smile in response to the presentation of the human face has the negative value of "not friendly." (Fraiberg, 1977, pp. 220-221)

Fraiberg learned that visually impaired infants have a nonvisual "vocabulary" of signs and signals. The signs of interest and preference that are not visibly displayed on the face are instead evident in blind children's hands. The "sign system" of the hands, however, is at times difficult to interpret. Hand movements, without direction of gaze, may not indicate the source of the blind child's interest.

Als, Tronick, and Brazelton (1980) discovered other communicative behavior of blind children that may not initially be easy to interpret. They observed a blind infant who displayed interest in her surroundings with neutral facial expressions, stilling, and a closed-in posture. While the mother of this infant quickly learned to respond to these behaviors, her father did not. Rather than interpreting them as indicators of a readiness to interact, the child's father misread the

behaviors as signs of disinterest and withdrew from his daughter when she was most ready to interact.

Blind infants do not often encourage their parents to interact with them (Fraiberg, 1977; Urwin, 1978). Before they learn to talk, the blind do not offer or show objects, methods used by sighted children to begin interaction with their caregivers. Because blind infants are not able to initiate and maintain interaction to a degree equivalent to sighted peers, one might expect, as did Fraiberg (1977), that these children would receive less input from their caregivers. This does not necessarily occur. The mothers of the blind children in studies by Urwin (1978) and Rowland (1980) talked as much as mothers of sighted children. Rowland, however, did find that the mothers of blind children talk about the same topic for longer periods than mothers of sighted children.

Despite the challenges that face blind infants and their caregivers, many families learn to engage in satisfying interaction. Routines are a means by which blind children's language development can be fostered (Rogow, 1982; Urwin, 1978). Even blind children who are initially resistent to interaction can benefit from social routines (Rogow, 1982).

Early Language Development -- Babbling and Early Words

At about 5 months, infants begin to babble and produce a wide variety of consonant and vowel sounds. They combine these sounds into continuous streams of "speech" which may be produced with rising and falling intonation. Infants sometimes sound as though they are trying

to communicate and, in fact, during the latter part of the babbling stage, some infants use particular sounds in consistent and meaningful ways (Halliday, 1975). Caregivers richly interpret their infants' babbling and help them to begin the process of mapping meaning onto words. They respond to the messages in infants' babbling and provide the words that convey those messages.

At around 1 year, children begin to learn words for the objects, persons, and events that are of interest to them. When children first use words, the meanings they assign to them may differ significantly from the actual meanings known to competent speakers of their language. Children often overextend and underextend the meaning of words as they generate hypotheses about their language (Bowerman, 1978; Clark, 1974). The physical properties of objects, shape in particular, as well as the functions of objects are the basis for many of the extensions of meaning (Bowerman, 1978; Nelson, 1974). For example, a child might use the word doggie to refer to dogs as well as to all four-legged, furry animals. As their experiences broaden and as their hypotheses are corrected by others, children redefine their vocabularies. Children's early word usage tells us how they are organizing their experiences.

Although children's words are often only approximations of real words, they are generally understood by caregivers. The nonverbal behavior of children along with contextual information enable caregivers to respond appropriately most of the time. Likewise, children rely on the gestures and gaze of their caregivers, along with the events taking place before them, to decipher their caregivers' speech. Caregivers simplify this task by talking about the "here and now" and by focusing on what already interests the child. Newport, Gleitman, and Gleitman (1977) have suggested that this here-and-now

quality of input helps children: "Specifically the mother helps by talking when the child's eye (either the mind's eye or the face's eye) is on the word or construction referred to" (p. 138). With the message of their input already in mind, children can focus on its form (Shatz, 1978). It is this responsive quality of caregivers' speech that is so important for language and cognitive development (Clarke-Stewart, 1973; Cross, 1977).

Blind Children's Early Language Development

Visual information plays such an important role in early language development that we might expect blind children to have difficulty learning about the meaning and use of language. Until recently however, most researchers believed that blind children's language development was comparable to or even more advanced than that of sighted children (Chomsky in Piattelli-Palmarini, 1980; Fraiberg, 1977).

Norris, Spaulding, & Brodie (1957), who studied the development of 295 blind preschool children, attributed language delays to "the nature of the [blind] child's relationships with other people and the lowered level of parental expectations" (p. 24) and not to the child's inability to see. Norris et al. assessed language competence with items from the Cattell Infant Intelligence Scale (1940) which tap very general and superficial language abilities (e.g., use of 1-5 words).

Fraiberg (1977) carefully documented the development of 10 congenitally blind infants and concluded that blindness, in itself, need not significantly impede language development during the first 2

years. Fraiberg assessed language competence using items that did not require visual information from the Bayley Scales (1969). The children she studied compared favorably with sighted children on the following Bayley milestones: "Listens selectively to familiar words," "Responds to verbal requests," "Jabbers expressively," "Imitates words," and "Uses words to make wants known." These Bayley milestones did not, however, adequately assess the communicative competence of blind children which Fraiberg, herself, pointed out. While they may be useful in identifying high-risk infants who are extremely language delayed, the Bayley items do not adequately assess the development of higher functioning blind children. Furthermore, these milestones do not assess the quality of interaction between child and caregiver which can have a significant impact on the child's overall development.

Semantic Development

In the past decade a number of researchers have taken a closer look at the language development of blind children. The field of child language has expanded considerably in the past 15 years, and new methods of data collection and analysis are available for measuring blind children's communicative competence. No longer are investigators restricted to word counts; they can now examine what blind children know about the meaning and use of language. Recent studies using these new techniques suggest that there are significant differences between the language development of blind and sighted children. We will begin by reviewing the studies of blind children's vocabulary development.

The early vocabulary development of blind and sighted children is

similar in a number of ways. The blind children studied by Bigelow (1982) acquired their first words between the ages of 14 and 16 months. They attained 50-word vocabularies between 16 and 21 months. The ages at which these basic language milestones were attained by the blind compare favorably with sighted children's norms. Two of the visually impaired children in a study by Landau (1983) were delayed in acquiring their first 50 words; however, Landau attributed the delay to the children's prematurity rather than to their visual impairment. A study that did find significant delays in the language development of blind children was conducted by Reynell (1978). In the Reynell study, the blind and partially sighted children were 6 to 8 months delayed in using words and were 18 months delayed in labeling objects. Reynell attributed these significant delays in language development to the absence of visual input which enables most children to relate language to their experiences in a meaningful way. Considerable delays in vocabulary development may have been found in the Reynell study but not in studies of other blind samples due to differences in the investigators' criteria for selecting subjects. While Reynell examined blind children with additional handicaps, Bigelow and Landau studied children who were visually impaired but otherwise intact and not severely developmentally delayed.

Similarities in the content of blind and sighted children's early vocabularies have also been reported. Blind and sighted children acquire object and person names, action words, and words that serve a social function (e.g., please, thank you) at the same age. Comparisons of word lists, however, do not warrant Landau's conclusion (1983) that blind children talk about their environment in the same way as sighted children. Bigelow (1982) and Dunlea (1982) took a closer look at how

blind and sighted children use their first 50 words and found significant differences. Unlike sighted children who extend many of their early words to refer to other similar referents, the blind children in their studies generally did not extend their first 50 words. A blind child may label only her stuffed toy a giraffe, while a sighted child is likely to extend the word to pictures of giraffes, to giraffes seen on television, and to other animals that have spots and long necks.

Dunlea (1982) conducted the most detailed analysis of blind children's early semantic development, an analysis of 13,000 interactive turns. Her data included video- and audio-taped naturalistic mother-child interaction and maternal diary records of the children's vocabulary development. Dunlea found that the blind children did not use language or play to classify their experiences. For example, at 2 years they did not group together toys that were similar or different in shape, texture, or function. These observations of linguistic and play behavior suggest that blind children do not build hypotheses about their environment to the same extent as do sighted children. In addition, the blind children did not create idiosyncratic words (i.e., words that do not exist in the language being learned but that are invented and used with consistent meaning). Sighted children often invent words as they acquire language. The absence of invented words in blind children's early vocabularies suggests that these children may acquire language in a more restricted and imitative manner than sighted children.

A number of researchers have reported that blind children frequently imitate the language of other persons without fully analyzing it. An example from Dunlea's data (1982) illustrates the

strategy: Teddy said, "Do you wanna take a bath?" as he heard his mother running water for his bath. His intention had been "I want to take a bath." Teddy's question was generally asked of him by his mother on similar occasions. While all children imitate some of the language they hear, Dunlea reported that blind children took longer to analyze the chunks of speech they imitated. Wills (1979) reported that this speech, which she called "situational phrases," helped blind children understand the present in terms of the past. The problem with this unanalyzed speech is that it sometimes created communicative breakdowns because of the inappropriate sentence forms and pronouns used by the children. Urwin (1978) described this speech as the beginning of role-play. She reported that blind children represented themselves and other persons in speech rather than in play as do sighted children. However, Anderson et al. (in press) found that blind children have difficulty analyzing the meaning of this "role-play" speech and fail to incorporate it into conversation. The blind children they studied had particular difficulty understanding and using language that encoded shifting perspectives (e.g., pronouns). Further research is needed to determine the process by which blind children analyze the components of speech they imitate.

The findings from recent studies have significant implications for the assessment of blind children's communicative competence. The early language development of these children cannot be assessed solely with items from tests designed for sighted children. Blind children's understanding of the words they learn must be considered, not only the size of their vocabularies, if we are to identify those children who require intervention.

Children make a number of important advances towards communicative

competence during the second year: they expand their vocabularies, combine words into sentences, and increasingly respond to the interests of their listeners. A few months after their single-word utterances, most children produce their first 2-word utterances. The information that is missing in 2-word utterances (e.g., articles, prepositions) is filled in by children's gaze and gestures. Caregivers often expand these "telegraphic" utterances. They express children's ideas in complete sentences, making certain they have correctly interpreted children's intentions. This feedback, which is both contingent upon their immediate interest and slightly advanced of their performance abilities, helps children learn language.

In their 2-word utterances children sometimes describe their surroundings. Howe (1981) reported differences in the extent to which sighted children and their mothers used descriptions. Some mother-child pairs labeled but seldom described objects, while other pairs often described objects in rich detail. Mothers who provided descriptive information helped their children to expand upon the properties of objects.

Dunlea (1982) found that blind children did not describe the qualities of objects in their 2-word utterances although they frequently labeled objects. Descriptive language from caregivers could encourage blind children to expand upon object labels and could provide them with information that might help them categorize their environment. Kekelis and Andersen (1984) originally hypothesized that blind children would receive descriptive input; in fact, they received fewer descriptions than did sighted children between 1 and 3 years. Current assessments and intervention programs for blind children may unintentionally promote label-focused rather than descriptive language

between blind children and their caregivers since language ability is measured by the number of words blind children acquire. New directions must be taken to insure that blind children acquire genuine communicative competence.

Language Styles of Children and Their Caregivers

Children differ in their approaches to learning language. In a longitudinal study of sighted children's vocabulary development, Nelson (1973) discovered two different strategies that are used by children as they acquire language: a referential approach and an expressive aproach. Children who Nelson described as referential acquired 50-word vocabularies that were object-oriented and consisted mostly of single-word units. Children who used an expressive approach were more socially-oriented and acquired more multi-word utterances. Differences in the children's approaches to language were not, in themselves, critical to development. However, Nelson found that language development was facilitated by the match between children's and mothers' language styles and by mothers' acceptance of their children's learning styles. Visual information helps caregivers understand and respond to the intent of their children's speech, regardless of the children's language approach.

There are no studies, comparable to Nelson's work (1973), that examine caregivers' acceptance of blind infants' language. We would, however, expect it to be more difficult to understand blind children's intentions. Data from a longitudinal study by Andersen (1980, 1981) suggest that caregivers have difficulty interpreting blind children's

single-word utterances (Kekelis & Andersen, 1984). They frequently interpret these utterances as labels of objects or requests for objects. While there is nothing wrong with these responses, too many name-oriented responses can limit blind children's communicative possibilities. One child in the Andersen study who began with a social approach to language development was frustrated by the referential approach (object- and name-oriented) imposed by her mother. Her expressive speech was often ignored or misinterpreted. After months of frustrating mother-child interactions, which often ended in temper tantrums, this child restricted her language to labels of objects and requests for objects.

Assessments of language competence must address not only the blind child's approach to language learning but also the extent to which that approach is encouraged by caregivers. More research is needed in this area to identify features of blind child-caregiver interaction that impede and facilitate language growth.

Caregiver-Child Interaction

Interaction with caregivers enables children to acquire a high level of communicative competence in a short amount of time. As Wells (1981) put it, parents "lead from behind." They expand upon children's linguistic skills while responding to their present interests. Caregivers read meaning into children's gestures, interpret children's first words, and expand their 2-word utterances. Their input to young children has a number of features that facilitate language learning: short, well-formed sentences; raised pitch and exaggerated intonation;

slow rate; and focus on the here and now. (See Snow & Ferguson, 1977, for a discussion of the Baby Talk register used by caregivers.)

Researchers have begun to find a number of significant differences in interaction between caregivers and children as they have looked more closely at individual pairs within their study samples. For example, McDonald and Pien (1982) discovered that mothers used language either to elicit conversation with children or to direct children's behavior. The latter use was characterized not only by more imperatives, but also by frequent negation of children's behavior, unequal distribution of speaker turns, fewer questions, and little topic maintenance.

Researchers have also found differences in the responsiveness of caregivers. Schachter (1979) learned that "advantaged" mothers provided their children with significantly more responsive input than did "disadvantaged" mothers. (Mothers were classified in terms of their level of education.) Both kinds of mothers provided their children with equal amounts of spontaneous language. Children who received responsive input were more linguistically advanced. Schachter explained:

> A strategy of support for the child's own actions amplifies his or her impact on the environment and affirms his or her role as an active explorer. This experience is likely to engender a sense of self-confidence and a feeling of mastery and power that is bound to affect the child's performance in linguistic and cognitive tasks. (p. 157)

The difference in caregivers' language may reflect differences in their understanding of child development, their views on child rearing, or their feelings of effectiveness as parents. Children's own language may also affect the language provided by their caregivers. Barnes, Gutfreund, Satterly, and Wells (1983) suggest that children's ability

to communicate may affect the responsiveness of their parents. Those who provide language that is of interest to their parents and that can be elaborated may receive the most stimulating, responsive input. Not all children, however, have the competence to elicit this kind of positive response from their caregivers.

Field (1980) discovered that mothers of 4-month-old premature infants (infants who were more fussy and less attentive than normal, full-term infants) were less imitative of and less attentive to their children's behavioral states. When the children were 2 years old, these mothers used more imperatives and fewer statements than mothers of full-term children. The premature children's language was below average: they had smaller vocabularies and shorter utterances and were less active in mother-child interaction than average children.

Young hearing-impaired children who cannot respond verbally to their caregivers receive directive input that is sometimes repetitive (Carmichael & Greenberg, 1980; Schlesinger & Meadow, 1972). Schlesinger (1972) explains that it is difficult for caregivers of deaf children to provide appropriate stimulation because they do not receive sufficient feedback from their children. They spend less time overall interacting with their children and have difficulty maintaining topics. A study of children with Down's syndrome by Jones (1980) again demonstrates the role children play in determining the quality of their parents' speech. These children provided fewer novel vocalizations and made fewer attempts to attract and direct their mothers' attention. In turn, the mothers became directive, feeling they had to work hard to maintain interaction. They responded to their children's utterances with 1-word expansions (e.g.,<u>yes</u>, <u>mm</u>) rather than with elaborate comments. Down's children do not allow time for elaborate expansions

of their vocalizations because they produce turns in rapid succession.

Studies such as those previously described indicate that it can be difficult for caregivers to talk to handicapped children in a manner that promotes development. Caregivers' language may be of special importance to blind children who lack visual input which typically stimulates language development. Recent studies, however, indicate that caregivers provide blind children with restricted language. They provide commands rather than contingent responses, labels instead of descriptions, and child-centerd instead of environment-focused language (Kekelis & Andersen, 1984). With such linguistic input, blind children may become increasingly verbal but their communicative competence may not increase.

Not only must one consider caregivers' input to children, but children's input to caregivers. Bloom, Rocissano, and Hood (1975) found that children between the ages of 19 and 23 months responded contingently to over half of their mothers' turns. Twenty-two- to 26-month-old children responded contingently to at least 70 % of their mothers' speech in a study by Rocissano (1981). At 22 months, these children were encouraged to respond with questions and requests for information and actions. At 26 months they encouraged their mothers to respond with smiles, gestures, and language. Visual information helps most children engage in contingent interaction with their caregivers. In general, the interest of children and their caregivers is focused on the events before their eyes.

Detailed discourse analyses from the Andersen study indicate that blind children and their caregivers have difficulty maintaining synchronous interaction (Kekelis & Andersen, 1983). As blind children acquire language, they become active in interaction and initiate a

greater number of topics (Andersen & Kekelis, 1982). However, they do not maintain interactions by responding contingently to their partners' speech to the same degree as do sighted children. Blind children often ignore their partners' questions and commands and abruptly shift topics in the middle of conversations thereby creating communicative breakdowns.

Blind children's asynchronous language affects the input they receive from caregivers. Kekelis and Andersen (1983) found that caregivers respond to blind children's asynchronous speech with directive input or with label-oriented rather than descriptive language. Learning to respond to the interests of other persons is an important skill for blind children to acquire and one that needs to be addressed when assessing these children.

The findings that emerge from recent studies of blind children suggest that visual impairment may alter the course of language development. The absence of gaze and gesture make it difficult for caregivers and blind children to engage in satisfying and enriching interaction. Without visual input, children have limited understanding of the meaning of the words they acquire and have difficulty analyzing the speech they imitate. Further research is needed to determine rates and patterns of language development that are acceptable for children with little or no vision.

Guidelines for Assessing the Communicative Competence of Blind Children

Clinicians currently assess blind children's language with test items from scales established for intact children. They record the

acquisition of sounds, words, and word combinations. These "milestones" do not address concerns that research has shown to be most relevant to blind children: the understanding and use of language. Decisions that affect intervention are based upon assessments. Therefore, it is critical that language scales identify the communicative strengths and weaknesses of blind children that are critical to language, social, and cognitive development.

Studies of blind children's language development provide new directions for assessment. The following guidelines are intended to generate more accurate assessments of blind children's communicative competence.

1. Language develops from early caregiver-child interaction. Before blind children communicate with words, we must examine how they attract and direct the attention of their caregivers and also how they monitor and respond to their caregivers' interest. Their early sign systems may need to be clarified for their caregivers.

2. Language reveals the ways in which children organize their experiences. By assessing use of early words, we may better understand blind children's linguistic and cognitive competence. Do they extend newly acquired words to a variety of referents? Do they understand the speech they imitate? Caregivers may need to provide additional stimulation to expand blind children's limited comprehension of language.

3. Language can be used for a number of communicative functions (e.g., label and describe objects, talk about oneself or others). Some of these functions (e.g., descriptions, references to other persons) may help children learn about their environment. An assessment should

determine if blind children use a variety of language functions. If they do not, caregivers may need to model and reinforce particular language uses.

4. If communicative competence is to be assessed, we must consider how well blind children interact with other persons. Are they able to initiate topics as well as respond to interests of other persons? When misunderstood, are they able and willing to try alternate approaches? Are interactions enjoyable for themselves and their partners?

5. Language from caregivers helps children learn to talk. How well do blind children elicit appropriate input from their caregivers? Do the families of blind children challenge them to advance in their language development?

The ultimate goal of an assessment is to determine intervention approaches best suited to blind children and their families. A review of recent literature indicates that visual impairment often affects caregiver-child interaction and the development of communicative competence. A language assessment must be sensitive to the special needs of the visually impaired.

References

Als, H., Tronick, E., & Brazelton, T.B. (1980). Affective reciprocity and the development of autonomy. American Academy of Child Psychiatry, 19, 22-40.

Andersen, E.S. (1980). Report on first year's activities of Spencer Foundation Grant: The emergence of communicative competence in blind children.

Andersen, E.S., Dunlea, A., & Kekelis, L.S. (in press). Blind children's language: Resolving some differences. Journal of Child Language.

Andersen, E.S., & Kekelis, L.S. (1982). The role of visual perception in early caregiver-child communication: Some "input" from the blind. Paper presented at the Seventh Annual Boston University Conference on Language Development.

Barnes, S., Gutfreund, M., Satterly, D., & Wells, G. (1983). Characteristics of adult speech which predict children's language development. Journal of Child Language, 10, 65-84.

Bayley, N. (1969). Bayley scales of infant development. New York: Psychological Corporation.

Bigelow, A. (1982). Early words of blind children. Paper presented at the International Conference on Infant Studies, Austin, Texas.

Bloom, L., Rocissano, L., & Hood, L. (1976). Adult-child discourse: Developmental interaction between information processing and linguistic knowledge. Cognitive Psychology, 8, 521-552.

Bowerman, M. (1978). The acquisition of word meaning: An investigation of some current conflicts. In N. Waterson & C. Snow (Eds.), Development of communication: Social and pragmatic factors in language acquisition (pp. 263-287). New York: Wiley & Sons.

Bruner, J.S., & Sherwood, J. (1976). Peekaboo and the learning of rule structure. In J.S. Bruner, A. Jolly, & K. Sylva (Eds.), Play - Its role in development and evolution (pp. 277-285). New York: Basic Books.

Carmichael, H., & Greenberg, M.T. (1980). A comparison study of functional communication in deaf vs. hearing mother-child dyads: Descriptive analysis and intervention implications. Revised version of paper presented at the the UAP-USC Annual International Interdisciplinary Conference on Piagetian Theory and the Helping Professions, Los Angeles.

Cattell, P. (1940). The measurement of intelligence of infants and young children. New York: The Psychological Corporation.

Clark, E.V. (1974). Some aspects of the conceptual basis for first language acquisition. In R.L. Schiefelbusch & L.L. Lloyd (Eds.), Language perspective - Acquisition, retardation, and intervention

(pp.105-128). Baltimore: University Park Press.

Clarke-Stewart, K.A. (1973). Interactions betweens mothers and their young children: Characteristics and consequences. Monographs of the Society for Research in Child Development,38, (6-7, Serial No. 153).

Cross, T.G. (1977). Mothers' speech adjustments: The contribution of selected child listener variables. In C.E. Snow & C.A. Ferguson (Eds.), Talking to children. Language input and acquisition (pp. 151-188). Cambridge: Cambridge University Press.

Dunlea, A. (1982). The role of visual information in the emergence of meaning: A comparison of blind and sighted children. (Doctoral dissertation, University of Southern California, Los Angeles) Dissertation Abstracts International, 43, 1130A.

Field, T. (1980). Interactions of high-risk infants: Quantitative and qualitative differences. In D. Sawin, R. Hawkins, L. Walker, & J. Penticuff (Eds.), Exceptional infant: Psychosocial risks in infant-environment transactions (Vol. 4) (pp. 120-143). New York: Brunner/Mazel.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Goldberg, S. (1977) Social competence in infancy: A model of parent-infant interaction. Merrill-Palmer Quarterly,23,163-177.

Halliday, M.A.K. (1975). Learning how to mean: Explorations in the

development of language. London: Edward Arnold.

Howe, C. (1981). Acquiring language in a conversational context. New York: Academic Press.

Jones, O.H.N. (1980). A comparative study of mother-child communication with Down's Syndrome and normal infants. In D. Shaffer & J. Dunn (Eds.), The first year of life: Psychological and medical implications of early experience (pp. 175-195). New York: Wiley & Sons.

Kekelis, L.S. (1981). Mothers' input to blind children. Unpublished master's paper, University of Southern California, Los Angeles.

Kekelis, L.S., & Andersen, E.S. (1983). The role of children in determining the nature of their linguistic input. Paper presented at the Eighth Annual Boston University Conference on Language Development.

Kekelis, L.S., & Andersen, E.S. (1984). Family communication styles and language development. Journal of Visual Impairment and Blindness, 78, 54-65.

Landau, B. (1983). Blind children's language is not "meaningless." In A. Mills (Ed.), Language acquisition in the blind child. Normal and deficient (pp.62-76). San Diego: College-Hill.

McDonald, L., & Pien, D. (1982). Mother conversational behavior as a

function of interactional intent. Journal of Child Language,9, 337-358.

Nelson, K. (1973). Structure and strategy in learning to talk. Monographs of the Society for Research in Child Development,38,(1-2, Serial No. 149).

Nelson, K. (1974). Concept, word, and sentence: Interrelations in acquisition and development, Psychological Review, 81, 267-285.

Newport, E.L., Gleitman, H., & Gleitman, L.R. (1977). Mother, I'd rather do it myself: Some effects and non-effects of maternal speech style. In C.E. Snow & C.A. Ferguson (Eds.), Talking to children. Language input and acquisition (pp. 109-149). Cambridge: Cambridge University Press.

Newson, J. (1979). The growth of shared understandings between infant and caregiver. In M. Bullowa (Ed.), Before speech: The beginning of interpersonal communication (pp.207-222). Cambridge: Cambridge University Press.

Norris, M., Spaulding, P.J., & Brodie, F.H. (1957). Blindness in children. Chicago: University of Chicago Press.

Piattelli-Palmarini, M. (1980). Language and learning. The debate between Jean Piaget and Noam Chomsky. Cambridge: Harvard University Press.

Reynell, J. (1978). Developmental patterns of visually handicapped children. Child: Care, Health, and Development,4, 291-303.

Rocissano, L. (1981). Synchrony and joint attention in mother-toddler interaction and language outcome. Paper presented at the New York Child Language Conference.

Rocissano, L., & Yatchmink, Y. (1983). Language skills and interactive patterns in prematurely born toddlers. Child Development,54, 1229-1241.

Rogow, S.M. (1982). Rhythms and rhymes: Developing communication in very young blind and multihandicapped children. Child: Care, Health, and Development,8, 249-260.

Rowland, C.M. (1980). Communicative strategies of visually impaired infants and their mothers. Unpublished doctoral dissertation, University of Oklahoma.

Schachter, F.F. (1979). Everyday mother talk to toddlers: Early intervention. New York: Academic Press.

Schlesinger, H. (1972). Meaning and enjoyment: Language acquisition of deaf children. In T.J. O'Rourke (Ed.), Psycholinguistics and total communication: The state of the art (pp. 92-102). Washington, D.C.: American Annals of the Deaf.

Shatz, M. (1978). The relationship between cognitive processes and the

development of communication skills. In C.B. Keasey (Ed.), Nebraska Symposium on Motivation, 1977. Lincoln: University of Nebraska Press.

Snow, C.E., & Ferguson, C.A. (Eds.) (1977). Talking to children. Language input and acquisition. Cambridge: Cambridge University Press.

Urwin, C. (1978). The development of communication between blind infants and their parents: Some ways into language. Unpublished doctoral dissertation, Cambridge University, Cambridge.

Wells, G. (1981). Becoming a communicator. In G. Wells (Ed.), Learning through interaction. The study of language development (pp. 73-115). Cambridge: Cambridge University Press.

Wills, D.M. (1979). Early speech development in blind children. The Psychoanalytic Study of the Child, 34, 85-117.

COGNITIVE DEVELOPMENT

It is through interaction with the environment that children learn about its sights and sounds. They explore the properties of objects and watch and imitate the behavior of other persons. By age 2, children have constructed a number of hypotheses about the attributes of objects and persons. Much of their knowledge is acquired through the visual sense and their motivation to explore is aroused by it. The lack of vision imposes a barrier to early cognitive development.

> In contrast to the visual panorama, the endless spectacle of sensory pictures which furnish the sighted child's world from the moment he opens his eyes, the blind child's space is empty or sparsely furnished.... a world of evanescent objects, a world of magic, in which persons and things are subject to a capricious causality... the blind child at six months cannot find meaning in the sound that comes out of nowhere, the tactile engagement that now is here and now is not (Fraiberg, 1977, p.158).

Some blind children never acquire the means to adequately explore their environment. They fail to acquire skills during the sensorimotor period that are necessary for subsequent stages of conceptual development. It is therefore critical that the cognitive development of blind children be assessed in infancy to prevent long-term or irreversible delays in development. This chapter will review recent studies of the cognitive development of sighted and blind children and will discuss environmental factors that significantly affect cognitive growth. On the basis of these data, guidelines for assessing blind children's cognitive competence will be proposed.

Sensorimotor Development: Six Stages of Development

Piaget's (1952) observations of his own children have significantly contributed to our understanding of the cognitive development of infants. Piaget identified six developmental stages in the sensorimotor period. In each stage, infants develop more advanced skills for exploring and classifying objects. Although the rate at which infants acquire these skills may vary, the order in which they are acquired is invariant.

During the first month, infants practice reflexive behaviors on a variety of different objects. For example, infants extend the sucking reflex from their source of milk to fingers, clothing, and bedding and thereby discover that only certain objects produce milk. By practicing reflexes, infants strengthen behaviors they will later use to learn about the environment.

During the next stage which is characterized by primary circular reactions, infants continue practicing reflexive schemes and begin repeating behaviors that accidentally produce interesting results. At this stage, actions that are repeated are infant-centered. Between 1 and 4 months, infants begin to combine their schemes (e.g., looking towards the source of sounds).

Children repeat schemes that accidentally produce interesting environmental events during the stage of secondary circular reactions. For example, they may wave their arms and legs so that their cradle gyms continue to move and make sounds. Because infants do not yet fully understand causal relationships, they inappropriately overgeneralize schemes. For example, infants may try to control the behavior of other persons by waving their arms and legs, a scheme that

previously controlled the activity of objects. During this stage, a number of new schemes such as shaking, dropping, and tearing are acquired. These exploratory schemes enable infants to learn about the properties and the permanence of objects in their surroundings.

Late in the first year, infants begin to coordinate schemes in novel ways to cope with problems. Piaget gave us an example of this coordination of behaviors -- his son, at 7 months, combined the acts of striking and grasping to obtain a desired matchbox that was behind an obstacle.

Between 12 and 18 months, infants encounter a wide range of objects as they learn to walk. They become interested in novelty and intentionally vary schemes, observing the results of their actions. For example, during this stage infants drop objects from different heights onto different surfaces and in so doing, learn about the properties of objects, about cause-effect relationships, and about object relations in space.

The final stage of the sensorimotor period marks the transition from a sensorimotor to a conceptual style of environmental interaction and learning. Infants begin to represent objects and events internally. They think about the consequences of their actions before they act and use previous experiences to predict the outcome of their actions.

Branches of Psychological Development

During the sensorimotor period, infants acquire competence in a number of relatively independent cognitive domains. Uzgiris and Hunt

(1975) examined several branches of development and constructed six scales for the assessment of cognitive functioning during infancy. The scales focus on object permanence, means for obtaining desired events, vocal and gestural imitation, causality, spatial relations of objects, and schemes for relating to objects.

Cognitive development during the sensorimotor period is typically dependent on visual information. Infants with limited or no vision would therefore be at risk. It is surprising, however, that the development of blind infants has not yet been studied in a comprehensive manner although delays in cognitive functioning have been documented in later stages of blind children's development (Hatwell, 1966; Santin & Simmons, 1977). These later delays may be related to inadequate strategies for exploring and interacting with the environment at earlier ages. It is therefore critical that blind infants acquire appropriate strategies for relating to objects, a primary means for learning about the environment.

The attainment of object permanence has been studied in great detail by investigators of child development. In fact, it is the one conceptual skill of blind infants that has been thoroughly documented. The understanding that objects continue to exist when they are not perceived by one of the senses has significantly different implications for the development of blind and sighted infants. Before they understand the concept of object permanence, sighted infants reach for objects that look interesting. They explore these objects first with their mouths and later with their hands. From these hands-on experiences, sighted infants build hypotheses about the properties of objects and devise increasingly complex schemes for relating to objects. Before blind infants understand that objects have permanence,

they reach for objects that are in contact with some part of their body but fail to reach for objects that are within reach but not in contact with their bodies. At this point, they will not reach for objects that produce sounds (Fraiberg, 1977; Maxfield & Fjeld, 1942). Thus blind children may have fewer opportunities to explore objects in their surroundings and may have difficulty acquiring conceptual skills. In an extreme case reported by Fraiberg, a blind 9-year-old boy brought objects to his mouth but did not have any appropriate strategies for exploring objects with his hands. He was not aware that objects continued to exist when he was not in contact with them and did not search for objects in his surroundings.

Young sighted infants have many opportunities to see objects disappear from view and later reappear. By 7 months, they begin to understand objects that disappear from view continue to exist, and they search for those completely hidden behind single barriers. By 9 months, sighted infants locate objects covered by several screens. During their second year, they recover objects that are invisibly displaced behind several barriers. Fraiberg (1977) and Bigelow (1983) found that the stages of development of object permanence for blind and sighted children are comparable, however, the blind take longer to master the concept, particularly those blind children who do not receive adequate intervention.

Fraiberg documented two major stages in blind children's development of object permanence. In Stage I, blind infants reach in the midline plane using sound cues for sound-producing objects that they previously held. Immediately prior to this stage, blind infants may conduct random searches for objects after they have been taken away but are unable to use sound cues to locate objects. In Stage II, blind

infants reach at midline for objects solely on sound cues. The children in Fraiberg's study attained Stage II between 6 and 11 months (8 months, 27 days - median age). "Reaching on sound" was an important achievement for their overall development, since it appears that blind infants do not begin to walk until they understand that objects continue to exist when they are no longer at hand (Fraiberg, 1977). Sighted children are encouraged to take their first steps by the interesting play things and persons they see. Blind infants crawl and step towards auditory cues once sounds connote the presence of objects and persons.

Bigelow (1983) examined the development of reaching behavior of 5 blind children. Like Fraiberg, Bigelow found that tactile cues help blind children understand the existence and location of objects. Blind children first reach for toys that touch their bodies and later reach for sound toys that are pulled away. The children in the Bigelow study reached at midline for sound toys much later than the children studied by Fraiberg. Bigelow credited 2 of her subjects at 14 and 20 months. Two of her subjects had already acquired the skill when first observed at 13 and 20 months, while 1 subject, who was studied until 21 months, had not achieved the skill. The differences reported by Fraiberg and Bigelow may have been due to their criteria for the achievement of reaching skills. Fraiberg required only that her subjects reach for sound toys at midline one time. Bigelow credited her subjects when they directly reached at midline for sound toys in the majority of trials in the criterion session and in the following observation sessions.

From analyses of ten reaching tasks, Bigelow found that blind children first reach for objects they previously held, later they reach

for objects previously heard. When sound and tactile cues are in conflict, i.e., when a sound-making object is taken away at midline and moved to the side, blind children again rely first on tactile cues and later take into account sound cues.

Toward the end of their study, Fraiberg and her colleagues proposed that directional reaching was a more advanced skill than midline center reaching but did not have data to support their hypothesis. Bigelow, on the other hand, specifically examined directional reaching and found that blind children are able to locate objects more easily in the midline plane than objects out of the midline plane. She also reported that blind children locate objects at midline right and midline left before they successfully reach for objects in the midline up and down plane. She postulates that sounds from the right and left reach the listener's nearer ear first and thus provide directional cues. With sounds made in the up and down plane, the listener must learn to tilt his or her head in order to receive directional cues.

The studies of Fraiberg and Bigelow suggest that the attainment of object permanence is critical for blind children's overall development, particularly for their motor development.

> If we understand that the blind child lives in a near-void for much of his waking day, he can make few discoveries about the world around him until he becomes mobile. And if mobility itself is delayed until well into the second year, he will live for a perilously long time in this near-void in which the presence of the mother or other persons or ministrations to his own body become the only experiences which give meaning to existence. In these periods, when neither sound nor touch, feeding, bathing, nor play occur, there is nothing except his own body. Now we began to understand how some blind babies may never find the adaptive routes and remain frozen in the state of body-centeredness, passivity, immobility, and ultimately, non-differentiation. (Fraiberg, 1977, p.22).

To prevent developmental delays, intervention programs must insure that blind children are aware of available input in their environment (i.e., have acquired the concept of object permanence), and that they have the means to attain and explore the input.

Development of Means for Obtaining Objects

Sighted infants begin to acquire schemes for obtaining interesting input through eye-hand coordination. At 2 months, sighted infants watch their hand movements and learn that their actions create interesting events-- initially self-centered events. Soon afterwards, they use simple action schemes to control objects in the nearby surroundings. By about 8 months, infants begin to learn how to cope with obstacles in order to obtain desired objects. When desired toys are out of reach, infants devise strategies for obtaining them. They may request other persons to get the objects, crawl towards the objects, or use other objects to obtain play things. Between 12 and 18 months, increasingly complex schemes are devised to obtain desired objects. For example, sticks and strings may be used to bring distant objects within reach. With each new means for obtaining desired goals, infants become less dependent on other persons for stimulation and gain access to a wider range of objects from which to learn.

While it is critical that blind children develop appropriate means for obtaining desired objects (including those within reach and those in the more distant surroundings) there have been no in-depth investigations of the development of schemes for obtaining desired objects by the blind aside from the previously cited studies of object

permanence conducted by Fraiberg (1977) and Bigelow (1983). Research is needed to determine how blind infants express their desires for objects and events and how they obtain their goals.

Imitation

Imitation is an important means for sighted children to expand their knowledge of the environment. It promotes the use of objects in new and appropriate ways and fosters the use of appropriate actions in different social contexts. Young infants can, at first, imitate only those behaviors that are within their limited repertoire. By 10 months, however, they begin to model novel behaviors they see performed by other persons. Initially, children must be able to see imitated behaviors they perform. Later they can imitate "invisible" behaviors such as facial expressions. Near the end of the sensorimotor period, infants begin to imitate the actions performed by other persons in the past.

The lack of vision would significantly curtail an infants' ability to learn by imitation. Blind infants must therefore have opportunities to be in direct contact with other persons in order to learn their strategies for exploring and using objects. There is no research presently available that examines how blind infants learn the behaviors of other persons.

Understanding Cause-Effect Relationships

Uzgiris and Hunt (1975) identified seven stages in the development of infants' understanding of causal relations. In the early stages of the sensorimotor period, infants repeat actions that produce interesting results, anticipating the results of their actions. Because they are not yet aware of the causal relations, infants often use inappropriate behaviors to control the actions of other persons and objects. With feedback from their activities, infants begin to develop some understanding of the causes of events and the effects of their actions. During the last half of the first year, infants develop a less self-centered notion of causality and seek the assistance of other persons to obtain desired events. By observing other persons, children learn to use increasingly appropriate means to operate toys and household items. Their understanding of causality becomes increasingly accurate and by 18 months, they can independently operate a number of mechanical objects. At the end of the sensorimotor period, once children can recall previous experiences, they can more effectively select strategies to produce desired outcomes.

Without vision, the effects of self-directed and other-directed actions will be less apparent to infants. There is, however, no research available on the development of causality by blind infants. Studies are needed to determine how infants with vision loss learn causal relations and how caregivers can promote the development of this concept by blind infants.

Understanding Spatial Relations

Sighted children's understanding of spatial relations begins when

they look at objects in different locations and localize the source of sounds. When eye and hand are coordinated, infants are able to attain stationary objects and soon thereafter can anticipate the trajectories of falling objects and successfully locate them. Sighted children's ability to locate objects in space is dependent on visual information. Infants with vision loss must first attain some understanding of the permanence of objects before they can locate objects in their surroundings. As a result, their opportunities to obtain objects can be significantly limited.

Through play, infants learn about spatial relations that exist between objects. Vision loss appears to make it more difficult for infants to learn this relational concept. The blind twin in a study by Sokolow (1983), at 18 months, had difficulty understanding the task of putting a cube into a cup and did so successfully only after much prompting. In contrast, her sighted twin at the same age was able to put nine cubes into a cup without difficulty. The blind infants in the Norris, Spaulding, and Brodie (1957) study were several months delayed in learning to put one cube into a cup and were delayed over a year in using a container to carry small objects. At 15 months, sighted infants begin stacking objects to build towers. In the study by Norris et al., blind children were 30 months of age before they were able to construct a tower of three cubes. It appears that visual impairment restricts infants' use of objects during play activities and, in turn, limits their understanding of possible spatial relations among objects.

Interaction with Objects

The final series in the Uzgiris and Hunt Scale examines the ways

in which children interact with objects, an area that may pose problems for infants with vision loss. During the early stages of the sensorimotor period, infants indiscriminantly use objects to practice their schemes. From interactions with objects, infants learn about the properties of objects and acquire new strategies to explore a wider range of objects. Fraiberg (1977) reported, however, that some blind children hold their hands at shoulder height and do not seek stimulation with their hands. With intervention designed to encourage midline activities, these blind infants learned to explore their surroundings with their hands and subsequently demonstrated preference for objects and carefully examined the details of objects. In a comparative study of the play and language development of a pair of blind and sighted twins who participated in an intervention program, Sokolow (1983) found that the play behavior of the twins differed in a number of significant ways related to object interaction. At 18 months, the blind infant's play was repetitive, with familiar exploratory schemes, such as hitting and mouthing, exploited. The sighted twin, in contrast, used significantly more schemes to explore objects. She carefully examined, both visually and manually, the properties of objects and selected schemes that were appropriate for the objects with which she played. By the end of the sensorimotor period, differences in the play behavior that were due to vision loss were reduced. The blind twin no longer mouthed objects, but instead used advanced schemes to examine the details of objects. Thus it appears that blind children can acquire necessary exploratory schemes with appropriate intervention.

As children explore their environment, they look for relationships among objects and events. In studies of children's play, researchers

have found that children classify their input according to the physical and functional properties of objects (Langer, 1980; Nelson, 1978). Vision is typically the means by which children compare and classify objects. Infants with vision loss must find alternate means to explore and classify input in their surroundings. Several researchers have investigated classification skills in blind infants. Gerhardt (1982) studied a blind infant from 14 to 18 months and found that the child acquired skills similar to those used by sighted children to classify objects, but acquired them at a slower rate. By 14 months, the blind infant had developed a highly functional strategy for exploring objects. She picked up objects, one in each hand, brought them together at midline, and explored them using a variety of schemes which included hitting, waving, biting, mouthing, and touching. This control over objects had significant consequences. "First, the child is able to become more intentional or deliberate about the activity with objects once she is able to control them. Second, the child can learn more about the objective properties and thus how to organize them and classify them" (Gerhardt, 1982, p.221). Throughout the study, the blind infant showed little preference for sound-making objects; rather, she focused on the physical properties of objects (shape, in particular).

Gerhardt observed a number of developmental trends over the 4 month period that indicated advancement in the exploration and classification of objects. The infant explored objects for longer periods and grouped together fewer objects at a time, strategies which appeared to increase her control over objects. At 18 months, the infant classified objects that shared similar properties, while at 14 months she had grouped together objects that were different. Vision

loss delayed this developmental progression. Sighted infants at 6 months group together objects that differ and at 12 months group together objects that are similar (Langer, 1980). Between 14 and 18 months, the blind infant extended the range of her exploration of objects away from her body and onto the floor. This development is also observed in sighted children (Piaget, 1952).

In a study of the semantic development of 4 blind children, Dunlea (1982) reported that children with vision loss did not possess classification skills comparable to the skills of sighted children. At 2 years, the blind children in the Dunlea study did not sort into classes any of the toys or familiar objects that were presented to them in an experimental probe. Furthermore, their mothers reported no evidence of spontaneous classification in their everyday play. Dunlea concluded:

> Thus, behavioral and linguistic evidence from the blind children appear to corroborate each other to suggest that the sensorimotor schemata for sorting elements of the environment by abstracting various criterial features is not functional at the same level for blind children as it is for sighted children at the onset of lexical development. (p. 164)

Further research of blind children's classification skills is needed to understand the discrepancies in the findings by Gerhardt and Dunlea.

The few available studies of small samples of blind infants indicate that visual impairment may alter the pattern and rate of cognitive development. The lack of visual input makes it more difficult for infants to obtain objects and to acquire appropriate exploratory schemes by which to generate concepts about them. Further research is needed to establish both the course and rate of cognitive development that is appropriate for infants with vision loss. With this information, clinicians will be better able to identify visually impaired infants who are at high risk and in need of immediate

intervention.

Motivation to Learn

Studies of infant development indicate that there are a number of similarities in the rate and manner in which infants acquire sensorimotor skills (Gesell & Armatruda, 1941; Piaget, 1952; Uzgiris & Hunt, 1975). Infants seem to be predisposed to interact with the environment in ways that lead them to make discoveries about common elements in the environment. They are attracted to objects and events that present moderately discrepant input from familiar situations. For example, McCall and Kagan (1967) found that 4-month-old infants looked longer at drawings and photographs of distorted faces whose features were moderately discrepant from human faces than at shapes with greater contrast. Furthermore, input that is at the brink of infants' understanding, that is neither completely familiar nor unfamiliar, expands infants' competence (Kagan, 1972). For example, infants will play longer with a toy that is slightly different from a familiar one than with a toy that is significantly different. With this type of stimulation, infants expand their problem-solving abilities. While infants may generally be attracted to novelty, Flavell (1977) points out that infants may sometimes prefer familiar stimulation. With this sort of input, they can practice and fully master skills and thus develop a sense of competence.

Play things that infants can control have an important role in early cognitive development. Papousek (1969) observed that infants smiled when they discovered that their head movements controlled a

light display during an experiment. In everyday life, infants' perceptions of controlling their environment reinforce their search for increasingly complex problems to solve. "Being able to do something to an object and to observe the consequences of this action undoubtedly enhances the child's developing sense of mastery and competence, the development of feelings that he can have an impact on his environment" (Yarrow & Pedersen, 1976, p. 389). Further research is needed to pinpoint the type of stimulation that attracts the interest of blind children at various ages and that promotes progressively complex cognitive skills.

Effects of the Physical and Social Environment on Development

As investigators have explored individual differences in child development, they have discovered a number of significant relationships between environmental variables and cognitive performance. In a detailed study of 41 infants, Yarrow, Rubenstein, and Pedersen (1975) found that the variety, complexity, and responsiveness of play things available to infants at 5 months, correlated with a number of cognitive skills including object permanence, problem-solving abilities, and interest in and ability to cope with novelty.

The quality of social interactions also plays a significant role in cognitive development. A number of studies have shown that optimal development is facilitated when caregivers both respond to their children's present interests and introduce challenging and novel tasks. Demos (1982) found that caregivers who support their children's learning have children who can concentrate on tasks and who are willing

to try activities not yet mastered. Intrusive caregivers, on the other hand, have children who are distractible and who are less able to master new tasks. In order to provide appropriate stimulation, it is important that caregivers have realistic expectations regarding their infants' abilities (Hunt & Paraskevopoulous, 1980). In their study, Norris et al. (1957) found that parents' expectations had a signficant impact on the development of visually impaired children.

No assessment for the visually impaired examines the ongoing transaction between these children and their physical and social environment, although such factors have been found to significantly affect development (Bradley & Caldwell, 1984; Parmelee, Kopp, & Sigman, 1976; Sameroff, 1979; Yarrow et al., 1975). With other at-risk populations, the assessment of the social environment has been found to be significant in the identification of children who are in need of immediate intervention (Sigman & Parmelee, 1979). Because infants with vision loss are particularly dependent upon input from their environment from which to learn, it may be even more critical that a transactional assessment approach be taken with the population.

Cognitive Assessments

Visual information plays a central role in the acquisition of cognitive skills. While it is critical to examine the cognitive functioning of visually impaired infants, this is often accomplished through the use of protocols designed for intact children. These assessment tools often provide little information about the blind infant's functioning within each domain of cognitive development.

Furthermore, many of the cognitive tasks on infant assessments require motor responses. Since the motor development of visually impaired infants is often delayed, their performance may be affected by motoric problems rather than by conceptual deficits. Perhaps the most serious shortcoming of tests developed for intact children is that they do not identify skills that are of special importance to the blind. For example, reaching at midline, which is facilitated by eye-hand coordination in sighted infants, can be delayed by a vision loss. Mastery of this skill is critical for the development of blind infants because it allows them to explore objects with their hands, and yet this skill is not given special treatment in assessments used with the visually impaired.

Recognizing the special needs of handicapped infants, a number of assessments have been designed for these children in recent years. While several of these protocols can be adapted for visually impaired children, many of these assessments have shortcomings. For example, some do not have a sufficient number of cognitive items in the birth to 2 year range to identify delays in conceptual development during the sensorimotor period. There is promise in recent assessments for intact and handicapped infants that are based on Piaget's model of sensorimotor development and on recent empirical work on various infant populations (Dunst, 1980; Foley & Appel, 1981; Uzgiris & Hunt, 1975). These protocols examine a number of conceptual domains which include object permanence, causality, spatial relations, and utilization of objects. These assessments examine a significantly larger number of intermediate steps in the attainment of various conceptual skills. Foley and Appel (1981) summarize the goal of such an assessment approach:

> It will give the evaluator a broader understanding of where and how the child is functioning and what constitutes the next most appropriate developmental steps. This in turn should shift the goal of instruction from the conditioning of isolated behaviors or splinter skills to an emphasis on the sequential and hierarchical development of generalized patterns or concepts. (p. 5)

Guidelines for Assessing the Cognitive Development of Visually Impaired Infants

Until further research is available, the following guidelines may be useful for assessing infants with vision loss.

1. It is important to observe visually impaired infants' interest in their surroundings. Do they express their desires for and interest in objects and activities in ways that other persons can understand? Caregivers may need guidance to learn the attentional cues of these infants in order to provide appropriate input which will stimulate cognitive development.
2. Sighted infants' attention is attracted to objects and other persons in the environment. Do the interests of the visually impaired also expand from self-centered to environment-related concerns during the sensorimotor period? If not, intervention may be needed to assist these children to find interesting input outside themselves.
3. By 8 months, does the infant demonstrate some awareness of the permanence of objects and other persons? Without this concept, the visually impaired infant does not comprehend that objects exist when out of reach and must often rely on others to provide outside stimulation.
4. How does the infant explore objects? Does he or she use appropriate schemes to discover the properties of objects rather than

indiscriminantly mouth or bang objects? It is important that an infant with vision loss explore and compare the shapes and textures of objects with his or her hands in order to learn how to appropriately use objects.

5. Is the available input sufficiently complex and novel that the infant can acquire increasingly advanced conceptual skills? In some cases, the absence of visual information restricts the richness of social and environmental stimulation, which may impede cognitive growth.

6. How does the infant learn the behaviors of other persons who cannot be seen? It is important that caregivers make their behavior meaningful to the visually impaired infant. Do they demonstrate ways to play with toys and ways to use household objects appropriately?

7. Does the infant sufficiently understand cause-effect relationships so that he or she anticipates the consequences of actions and effectively obtains desired events? When attempts are not immediately successful, is the infant able to find alternate means to desired goals? Do caregivers allow the infant to try again after he or she fails, or do they immediately solve the problems for the infant? It is through the resolution of conflicts that infants expand their cognitive competence.

It is hoped that the issues raised in these guidelines will be useful in planning assessments for visually impaired infants and in designing intervention programs that will meet the special needs of visually impaired infants.

References

Bigelow, A. (1983). The development of reaching in blind children. Unpublished manuscript, St. Francis Xavier University, Nova Scotia.

Demos, V. (1982). The role of affect in early childhood. An exploratory study. In. E.Z. Tronick (Ed.), Social interchange in infancy. Affect, cognition, and communication (pp. 79-123). Baltimore: University Park Press.

Dunlea, A. (1982). The role of visual information in the emergence of meaning: A comparison of blind and sighted children. (Doctoral dissertation, University of Southern California, Los Angeles). Dissertation Abstracts International, 43, 1130A.

Flavell, J.H. (1977). Cognitive development. Englewood Cliffs, NJ: Prentice-Hall.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Gerhardt, J. (1982). The development of object play and classifactory skills in a blind child. Journal of Visual Impairment and Blindness, 76, 219-223.

Gesell, A., & Armatruda, C.S. (1941). Developmental diagnosis: Normal and abnormal child development, clinical methods and practical applications. New York: Hoeber.

Hatwell, Y. (1966). Privation sensorielle et intelligence [Sensory deprivation and intelligence]. Paris: Presses Universitaires de France.

Hunt, J.M., & Paraskevopoulous, J. (1980). Children's psychological development as a function of the inaccuracy of their mothers' knowledge of their abilities. Journal of Genetic Psychology,136, 285-298.

Kagan, J. (1972). Do infants think? Scientific American,226, 74-82.

McCall, R.B., & Kagan, J. (1967). Attention in the infant: Effects of complexity, contour, perimeter, and familiarity. Child Development,38, 939-952.

Norris, M., Spaulding, P.J., & Brodie, F.H. (1957). Blindness in children. Chicago: University of Chicago Press.

Papousek, H. (1969). Individual variability in learned responses in human infants. In R.J. Robinson (Ed.), Brain and early behavior. London: Academic Press.

Piaget, J. (1952). The origins of intelligence in children. New York: International University Press.

Santin, S., & Simmons, J.N. (1977). Problems in the construction of reality in congenitally blind children. Journal of Visual Impairment and Blindness,71, 425-429.

Sigman, M., & Parmelee, A.H. (1979). Longitudinal evaluation of the pre-term infant. In T. Field, A. Sostek, S. Goldberg, & H. Shuman (Eds.), Infants born at risk: Behavior and Development (pp. 193-217). New York: SP Medical and Scientific Books.

Sokolow, A. (1983). Differences in play and language development in a pair of blind and sighted twin infants. In M.E. Mulholland & M.V. Wurster (Eds.), Help me become everthing I can be. Proceedings of the North American Conference on Visually Handicapped Infants and Preschool Children (pp. 117-122). New York: American Foundation for the Blind.

Uzgiris, I., & Hunt, J.M. (1975). Assessment in infancy: Ordinal scales of psychological development. Urbana, IL: University of Illinois Press.

Yarrow, L.J., & Pedersen, F.A. (1976). The interplay between cognition and motivation in infancy. In M. Lewis (Ed.), Origins of intelligence. Infancy and early childhood (pp. 379-399). New York: Plenum Press.

Yarrow, L.J., Rubenstein, J.L., & Pedersen, F.A. (1975). Infant and environment. Early cognitive and motivational development. New York: Wiley & Sons.

PLAY

The relationship of play to cognitive and social development has received much attention in infant research over the past 10 years. Although the applicability of this research to visually impaired infants has not been clearly demonstrated, the potential relevance of the assessment of play for the visually impaired is encouraging. Since research dealing with the play of visually impaired infants is sparse, this section will briefly review what is known about the development and assessment of play in normal infants, as well as present some findings related to handicapped infants. Studies involving the visually impaired will then be presented, and the value of the analysis of play behavior as an assessment technique for the visually impaired infant will be discussed. Of particular interest here will be the development of the cognitive components of play. The social components of play are discussed in the chapter dealing with social competence.

The Development of Play

While definitions of play vary, it has been found to contribute to a child's "problem-solving and tool-using skills, creativity, communicative and language development, Piagetian operativity, cooperation, perspective-taking, sex-role development, and cultural transmission" (Rubin, 1980, pp. 69-70). Play is thought to be a non-verbal indicator of cognitive ability (Hill & McCune-Nicolich, 1982; Zelazo & Kearsley, 1980). Copeland and Golden (1979) also contend that play in mentally retarded children aids in the development

of adaptive behavior skills such as fine and gross motor. This may occur because play fosters the strengthening and consolidation of newly-learned skills (Rubin & Pepler, 1982).

As infants mature, they learn that events and objects have an existence and function outside of themselves (Rosenblatt, 1979). The ability to represent something that is not present was called semiotic ability by Piaget (1967), and symbolic play as well as language are considered two manifestations of this ability. With the development of representational thought, the child's mental processes gain flexibility, and the child has increased mastery over the environment since the child can go beyond the here and now.

Since the development of symbolic play marks a major cognitive breakthrough for the child (Ungerer, Zelazo, Kearsley, & O'Leary, 1981), a number of researchers have investigated symbolic play and its precursors (Fenson, Kagan, Kearsley, & Zelazo, 1976; Nicolich, 1977; Ungerer et al. 1981; Zelazo & Kearsley, 1980). Results of these studies have led to a greater understanding of the developmental phases of play in infants and its cognitive components. Several tools to analyze play have also been developed with some variation amongst categories of play behavior (Belsky & Most, 1982; McConkey & Jeffree, 1980; Nicolich, 1980; Westby, 1980). Quoted here is the sequence of exploration/play proposed by Belsky and Most (1982) which was substantiated, for the most part, in a study with 40 infants between the ages of 7-1/2 and 21 months.

1. Mouthing--indiscriminate mouthing of materials (e.g., mouthing peg, sea shell, etc.).
2. Simple Manipulation--visually guided manipulation lasting at least 5 seconds in duration that cannot be coded in any other category (e.g., turning over an object, touching and looking at an object, but excluding indiscriminate banging and shaking).

3. Functional--visually guided manipulation which is particularly appropriate for a certain object and involves the extraction of some unique piece of information (e.g., turn dial on toy phone, squeeze piece of foam rubber, flip antenna of Buzy Bee, spin wheels on cart, roll cart on wheels).
4. Relational--bring together and integrate two or more materials in an "inappropriate" manner, i.e., a manner not initially intended by the manufacturer (e.g., set cradle on phone, touch spoon to stick).
5. Functional Relational--bring together and integrate two objects in an "appropriate" manner, i.e., in a manner intended by the manufacturer (e.g., set cup on saucer, place peg in hole of pegboard, mount spool on shaft of cart).
6. Enactive Naming--approximate pretense activity but without confirming evidence of actual pretend behavior (e.g., touch cup to lip without drinking sounds, tilt head back, or tip cup; raise phone receiver in proximity of ear but without talking sounds; touch brush to doll's hair but without brushing motions).
7. Pretend Self--pretense behavior directed toward self in which pretending is apparent (e.g., raise cup to lip, tip cup or make drinking sounds or tilt head; stroke own hair with miniature brush; raise phone receiver to ear and vocalize).
8. Pretend External--pretense behavior directed away from child toward other (e.g., feed doll with spoon, bottle, or cup; brush doll's hair, push car on floor and make car noise).
9. Substitution--a "meaningless" object is given meaning during a pretense act by using it in a creative or imaginative manner (e.g., drink from seashell, feed doll with stick as "bottle") or an object is used in a pretense act in a way that differs from how it was already employed by the child (e.g., hairbrush is used to brush teeth after child had already used it as a hairbrush on self or other).
10. Sequence Pretend--child repeats single pretense act with minor variation (e.g., drink from bottle, give doll drink; pour into cup, pour into plate) or child links together different pretend schemes (e.g., stir in cup, then drink; put doll in cradle, then kiss goodnight).
11. Sequence Pretend Substitution--same as Sequence Pretend but child employs an object substitution within sequence (e.g., put doll in cradle, cover with green felt piece as "blanket," feed self with spoon and then with stick).
12. Double Substitution--pretense play in which two materials are transformed, within a single act, into something they are not in reality (e.g., treat peg as doll and piece of green felt as blanket and cover peg with felt and say "night-night," treat stick as person and sea shell as cup and give stick a drink) [pp. 112-113].

There have been efforts to differentiate exploration from play, with "true" play occurring at the symbolic level and involving representational objects (e.g., a crayon is used to represent a toothbrush) (Rubin, 1980). As seen in the Belsky and Most categories, pretend activities that are planned and that require mental

representation in advance of performance delineate the most advanced levels of play. This is also true in criteria proposed by Nicolich (1977). Exploration, on the other hand, refers more to the examination of an object, situation, or event and occurs before play so that a child can become familiar with an object (Hutt, 1979).

It has been found that functional and physical properties of objects used to represent things not present (i.e., substitution symbols) change with increased age. Initial substitution symbols used by infants are ones whose functions are ambiguous (e.g., a block for a box of cereal) as these are less confusing to the child (Ungerer et al., 1981). Later, objects with specific functions are used as substitution symbols (e.g., a spoon for a toothbrush). Furthermore, initial objects chosen as substitution symbols are perceptually similar to objects they represent, but later, a larger percentage of perceptually dissimilar objects are selected as substitution symbols. Thus there is decreased dependence on physical resemblance in symbolic play as the infant matures.

Besides examining the developmental sequence of play, researchers have also been concerned with characterizing the overall picture of play behavior at various stages. In an investigation of the progressive shift from non-specific use to appropriate use of a particular toy, Rosenblatt (1979) found that normal infants add 25% more appropriate behavior every 3 months, with different play emphases at different developmental stages. While indiscriminate behavior (i.e., each toy is used in the same way) made up half of the 9-month-old infants' exploration and play, investigative play (i.e., exploration of specific characteristics) made up most of the other half along with 2% appropriate play (i.e., demonstration of knowledge of

specific functions or physical properties). As the infants matured, appropriate play made up 20% of play behaviors (by 12 months in normal infants) with indiscriminate and investigative play each accounting for 40%. Toys were combined and occasional representational schemes were used at this point. Sensorimotor play with a single toy accounting for most play behavior until 18 months, dropped to 20% and remained at that level from 18 to 24 months. Representational play with a single toy comprised 25% of all play at 15 months but increased to 75% at 18 months. Time spent in play with a specific toy and number of toys used in play have been found to increase with age, while distractibility has been found to decrease with age (Rosenblatt, 1979).

Implications of the Assessment of Play

The examination of play behavior as part of infant assessment protocols has been addressed in the literature. Nicolich (1980) states that there is less evidence for the assessment benefits of manipulative and relational play as opposed to pretend play. Since there is a close relationship between play and language, Largo and Howard (1979) contend that a combined assessment of both behaviors might be helpful in assessing young children with delayed or absent speech. The demonstration of age-appropriate receptive language and play for children with delayed expressive language would indicate that these children will eventually develop speech since they have the cognitive requisites for expressive language. This type of assessment can also indicate what intervention is appropriate and what direction this intervention should take (Westby, 1980). For example, if a child's

cognitive level, as assessed through symbolic play, is greater than the assessed language level, language remediation is recommended since the cognitive structures necessary for symbolic play and language are thought to be similar and have been demonstrated through the presence of symbolic play. Thus, the possibility for more advanced language is a viable one. On the other hand, if language level is equivalent to a child's cognitive level as assessed through play, or if the cognitive level is in a beginning sensorimotor stage, language intervention should be postponed or tailored to sensorimotor activities according to Westby.

Zelazo and Kearsley (1980) contend that play can be an alternative measure of cognitive ability for children who have had minimal prior experience interacting with objects and do not, therefore, engage in this behavior. They recommend an initial assessment of free play followed by brief training sessions by the mother. If, during the training sessions, the child demonstrates appropriate object play, the cognitive ability may be present. It may not have been expressed in free play due to limited environmental opportunities. These authors stress that this should be regarded as a qualitative measure indicating that improvement can be expected after intervention since the degree of improvement cannot be predicted. According to Hill and McCune-Nicolich (1981), symbolic play behavior is responsive to interventions that can be planned and implemented after a child's level of symbolic functioning has been determined through assessment. Copeland and Golden (1979) indicate that intervention programs should focus on expanding opportunities and experience at a child's assessed level. Stimulation at higher stages may not lead to accelerated progress until behaviors at earlier stages have been achieved. McConkey and Jeffree

(1980) incorporate this method in their recommended intervention program to promote pretend play in mentally retarded children. Krasnor and Pepler (1980) caution, however, that most correlations of play with social and cognitive skills in normal children are too low for accurate quantitative assessments of individual children and that more normative data are needed to judge developmental levels through play. It is possible, however, and it is essential with respect to handicapped children, to consider each child individually and to examine qualitative aspects of developing play behaviors.

Play Behaviors of Handicapped Infants

There have been some studies examining the play of handicapped infants. A study by Brooks-Gunn and Lewis (1982) will be presented to demonstrate some of the findings of this research and the problems in translating such findings for clinical application. Brooks-Gunn and Lewis investigated the play of 111 children with either Down's syndrome, motor impairment, or developmental delay with no known organic problem. The children ranged in age from 3 to 36 months and were compared with a group of 156 normal infants. The researchers found significantly less toy play behavior in the handicapped infant group than the normal group. The toy play of the children's mothers was also examined, and it was found that the mothers of the handicapped infants attempted to facilitate play behavior to a greater extent than mothers of normal infants by initiating and demonstrating more toy play. In addition, while interactive play increased with age in the normal infants, it decreased with age in the handicapped group,

probably due to increased infant-initiated toy play in the handicapped group with increased age. Among the three handicapped groups, differences were noted in toy exploration. The physically impaired infants were less likely to explore toys than either the Down's syndrome or developmentally delayed infants. The physically impaired were more likely to look at toys than infants in the developmentally delayed or Down's syndrome groups. Mothers were more likely to demonstrate and give toys to infants who were physically disabled, possibly as a way to compensate for their infants' lack of exploration.

From the Brooks-Gunn and Lewis study, it is evident that play behavior of handicapped infants is different from that of normal infants. Play behavior of infants with different handicapping conditions also varies. Furthermore, it is apparent that infant play behavior is shaped by both the child and the environment. In this case, the mothers modified their interactions with the infants in ways that appeared to encourage development, but interactions with caretakers can impede development as well when caretakers take too active a role and overcompensate for their children. While Hill and McCune-Nicolich (1981) demonstrated that symbolic play level was more highly correlated with mental age than with chronological age in a group of Down's syndrome children, Brooks-Gunn and Lewis (1982) noted that characteristics of the child other than mental age (such as presence of physical handicap) affected maternal and child behavior in a play situation. Factors other than mental age that affect play behavior were identified by Mogford (1977), who examined play behavior in mentally handicapped children. It was found that "although most mentally handicapped children progress slowly through a normal sequence of play development (i.e., developmental stages of play) parents often

complain of a lack of sustained attention as well as rough, destructive, or inappropriate use of objects along with marked lack of initiative" (p. 174). Thus it is important to examine these additional factors affecting the quality of play.

Play and Visually Impaired Infants

Little is known regarding the effects of visual handicap on the cognitive and social aspects of play, although lack of vision would likely modify the usual development of play behaviors since environmental input and exploration is limited. The cognitive aspects will be considered in this section. Burlingham (1961) noted the lack of play behavior of children enrolled in a nursery school for the blind. Singer and Streiner (1966), investigating fantasy play in blind and sighted children aged 8 to 12 years, found less varied content in the fantasy play of the blind, with more reliance on material encountered in everyday life as well as less exploratory behavior by the blind children.

Sokolow (1983) observed a pair of blind and sighted twin infants in toy play at 18 and 24 months. At 18 months it was found that the blind twin exercised familiar schemes with toys such as mouthing, banging, and shaking. The blind infant examined physical properties of the toys about 75% of the time and also displayed some complex motor schemes such as putting measuring cups inside one another. The sighted twin exercised more complex motor patterns more often. Differences in interaction patterns with the mother were also noted, with the sighted twin showing all toys to her at 18 months. On the other hand, the

blind twin interacted only with the toys and in a repetitive manner. At 24 months, the blind twin no longer mouthed the toys but instead used more complex exploratory schemes. She showed all the toys to her mother and demonstrated the emergence of symbolic play by placing a cup in her hand and stating, "Hat. I want a hat." While the blind twin became more interested in social play at 24 months, the sighted twin concentrated on exploration of toys and toy activities at that age.

Gerhardt (1982) examined object play in an infant born with optic nerve hypoplasia at 14, 16, and 18 months in order to investigate classificatory skills. She found that time spent exploring object properties increased from 14 to 18 months and the relationship between objects changed such that two-object configurations predominated at 18 months. Gerhardt postulates that the use of two objects rather than three or four affords the blind child more control since direct, simultaneous manipulation of objects (one in each hand) is possible. At 14 and 16 months, the infant showed no preference for sound-making objects, and minimal preference was exhibited at 18 months. Gerhardt stresses that manual control over the objects promoted the learning of relationships among objects and that this is more relevant at this stage than auditory cues. This is an important point since it has been commonly accepted that sound is important in stimulating exploration for blind children who lack motivating visual stimuli. Gerhardt also noted that the blind infant first produced the majority of two-object configurations in her hands (selecting objects on the floor and bringing them to midline) with an increase in two-object configurations produced on the floor from 11% at 14 months to 40% at 18 months. Here Gerhardt proposes a developing tendency of the blind child in her study to extend activity fom her body to an area outside the body, a trend

which she considers to be of clinical significance for intervention programs for blind infants. Gerhardt's hypotheses require additional investigation with a larger sample of blind infants.

Parsons (1982) compared play behavior in 18 low vision children and 18 normally sighted peers between 1 year 3 months and 4 years 4 months of age. The children with low vision engaged in less functional play with no increase in functional play with increased age. Low vision children exhibited more stereotypical play than their normally sighted peers. Furthermore, variety of appropriate uses of toys did not increase with age in the low vision group. No statistically significant difference was found in relational play between the two groups, nor in the overall number of appropriate uses for toys.

Fraiberg (1977) in her longitudinal study of 10 congenitally blind infants found that imaginative play (when children could represent themselves or others in inventive activities) emerged at 3 and 4-1/2 years in 3 of the youngsters. Sokolow (1983) reports behavior marking the emergence of symbolic play in the blind twin in her study at 24 months when the child refers to a cup as a hat. More research is needed to clarify the development of symbolic play in visually impaired infants.

Assessment of Play for Infants with Visual Impairment

Play is an important method by which the infant learns to increase mastery and control of the environment. It fosters the development of cognitive, motor, language, and social skills. Experiential opportunities for exploration and social interaction can affect both

the quality and quantity of play behaviors. It is widely recognized that early experiences for children with visual impairment differ from those of their normally sighted peers. It is not unexpected, therefore, that play behaviors have been found to differ in this population.

What is not known is the developmental sequence of play for infants with visual impairment and expected age levels for the attainment of various stages of play for this population. At this time, it is recognized that standardized data are still needed before a quantitative measure of levels of play for normal infants can be developed (Krasnor & Pepler, 1980). As a result, it is more realistic to consider the qualitative aspects of play for assessment purposes and to examine the relationship of play behaviors to other developmental phenomena (e.g., motor skills, social skills). This is particularly true for the visually impaired since the developmental levels of play are not known and the patterns of development may differ substantially from that of normally sighted infants (Parsons, 1982; Sokolow, 1983).

Even though research evidence is still rudimentary, the assessment of play in visually impaired infants may be of value. First, play involves readily observable behaviors that may reflect cognitive ability. Secondly, play can provide a non-verbal qualitative measure of cognitive ability. Third, an analysis of play, including its cognitive and social components, can provide a rich picture of the way an infant interacts with the environment and can provide direction for intervention/stimulation programs. Finally, play has been found to be responsive to intervention, although the generalizability of intervention achievements is not yet clear.

How can clinicians apply the current level of knowledge of the

cognitive components of play to the assessment of visually impaired infants?

1. A combined assessment of language and play can provide direction for a language-intervention program.

2. Object play can be encouraged with visually impaired infants, and each infant's developmental pattern of play can be documented. Since the general developmental stages of play for visually impaired infants is not known, each child can only be encouraged to progress at his or her own pace at this time. Existing play assessment material can be utilized as a guide only, and age level expectations cannot be applied to visually impaired infants (e.g., McCune-Nicolich, 1980; Westby, 1980).

3. The emergence of symbolic play can be used as a non-verbal qualitative measure of cognitive ability marking the beginning of representational thought.

4. For infants with limited experience interacting with objects, as with some visually impaired children, the ability to learn appropriate object play after brief training sessions is a qualitative indicator of previously untapped potential (Largo & Howard, 1979).

In terms of intervention, it is likely that object play can first be encouraged by providing objects that can be manipulated in one hand. The progression from two-object configurations held in the hand to two-object configurations on the floor noted by Gerhardt (1982) provides a beginning guide for understanding progressive development in toy play. Since play is responsive to intervention, it is possible that increased emphasis on appropriate play may decrease the time spent by visually impaired infants in stereotypical behaviors for stimulation, behaviors which do not serve to promote cognitive, social,

or motoric growth.

References

Belsky, J., & Most, R.K. (1982). Infant exploration and play: A window on cognitive development. In J. Belsky (Ed.), In the beginning: Readings in infancy. New York: Columbia University Press.

Brooks-Gunn, J., & Lewis, M. (1982). Development of play behavior in handicapped and normal infants. Topics in Early Childhood Special Education,2, 14-27.

Burlingham, D. (1961). Some notes on the development of the blind. Psychoanalytic Study of the Child,16, 121-145.

Copeland, A.P., & Golden, D.B. (1979). Assessing and facilitating play in handicapped children. Child: Care, Health and Development,5, 335-346.

Fenson, L., Kagan, J., Kearsley, R.B., & Zelazo, P.R. (1976). The developmental progression of manipulative play in the first two years. Child Development,47, 232-236.

Fraiberg, S. (1977). Insights from the blind. New York: Basic Books.

Gerhardt, J.B. (1982). The development of object play and classificatory skills in a blind child. Journal of Visual Impairment and Blindness,76, 219-223.

Hill, P.M., & McCune-Nicolich, L. (1981). Pretend play and patterns of cognition in Down's syndrome children. Child Development,52, 611-617.

Hutt, C. (1979). Exploration and play. In B. Sutton-Smith (Ed.), Play and learning. New York: Garden Press.

Krasnor, L.R., & Pepler, D. (1980). The study of children's play: Some suggested future directions. In K.H. Rubin (Ed.), Children's play (pp. 85-95). San Francisco: Jossey-Bass.

Largo, R.H., & Howard, J.A. (1979). Developmental progression in play behavior of children between nine and thirty months: II: Spontaneous play and language development. Developmental Medicine and Child Neurology,21, 492-503.

McConkey, R., & Jeffree, D. (1980). Developing children's play. Special Education: Forward Trends,7, 21-23.

McCune-Nicolich, L. (1980). A manual for analyzing free play. New Brunswick, NJ: Department of Education, Douglass College, Rutgers University.

Mogford, K. (1977). The play of handicapped children. In B. Tizard & D. Harvey (Eds.), Biology of play. Clinics in developmental medicine ser.: (Vol. 62) (pp. 170-184). Philadelphia: Lippincott.

Nicolich, L.M. (1977). Beyond sensorimotor intelligence: Assessment

of symbolic maturity through analysis of pretended play. Merrill-Palmer Quarterly,23, 89-99.

Parsons, A.A. (1982). An exploratory study on the patterns of emerging play behavior in young children with low vision: The acquisition of concepts as existence of cognitive development. Dissertation Abstracts International,43, 759-A.

Piaget, J. (1967). Play, dreams, and imitation in childhood. London: Routledge & Kegan Paul.

Rosenblatt, D. (1977). Developmental trends in infant play. In B. Tizard & D. Harvey (Eds.), Biology of play. Clinics in developmental medicine ser.: (Vol. 62) (pp. 33-43). Philadelphia: Lippincott.

Rubin, K.H., & Pepler, D.J. (1982). Children's play: Piaget's views reconsidered. Contemporary Educational Psychology,7, 289-299.

Singer, J.L., & Streiner, B.F. (1966). Imaginative content in the dreams and fantasy play of blind and sighted children. Perceptual and Motor Skills,22, 475-481.

Sokolow, A. (1983). Differences in play and language development in a pair of blind and sighted twin infants. In M.E. Mulholland & M.V. Wurster (Eds.), Help me become everything I can be. Proceedings of the North American Conference on Visually Handicapped Infants and Preschool Children (pp. 117-122). New York: American Foundation for the Blind.

Ungerer, J.A., Zelazo, P.R., Kearsley, R.B., & O'Leary, K. (1981). Developmental changes in the representation of objects in symbolic play from 18 to 34 months of age. Child Development,52, 186-195.

Westby, C.E. (1980). Assessment of cognitive and language abilities through play. Language, Speech, and Hearing Services in Schools,11, 154-168.

Zelazo, P.R., & Kearsley, R.B. (1980). The emergence of functional play in infants: Evidence for a major cognitive transition. Journal of Applied Developmental Psychology,1, 95-117.